UNIT I

INTRODUCTION TO BUILDING COMPONENTS AND THEIR NOMENCLATURE

Building an act of construction for human use layered over the earth - foundation, structural systems, enclosures, weather protection. Understanding building components and their nomenclature using historic and contemporary examples from literature study, site visits, sketches. The nomenclature to include 1) basic types of construction such as load bearing/framed/space structure 2) basic components in a building such as foundation, plinth, walls, floors, roofs(flat, sloped, vaulted),roof covering, ceilings, staircases (principles and different geometric types), doors, windows and ventilators, lintel, sunshade, coping, cornice, stringcourse, parapet, waterproofing, finishing, mortar, decoration, paving3) basic materials for the components.

Foundation

What is a Foundation in Construction?

Foundation is the lowest part of the building or the civil structure that is in direct contact with the soil which transfers loads from the structure to the soil safely. Generally, the foundation can be classified into two, namely **shallow foundation** and **deep foundation.** A shallow foundation transfers the load to a stratum present in a shallow depth. The deep foundation transfers the load to a deeper depth below the ground surface. A tall building like a skyscraper or a building constructed on very weak soil requires deep foundation. If the constructed building has the plan to extend vertically in future, then a deep foundation must be suggested. It is advisable to know the suitability of each type of foundation before their selection in any construction project.

What is the Purpose of Foundation?

Foundations are provided for all load carrying structure for following purposes:

- Foundation are the main reason behind the stability of any structure. The stronger is the foundation, more stable is the structure.
- The proper design and construction of foundations provide a proper surface for the development of the substructure in a proper level and over a firm bed.

- Specially designed foundation helps in avoiding the lateral movements of the supporting material.
- A proper foundation distributes load on to the surface of the bed uniformly. This uniform transfer helps in avoiding unequal settlement of the building.
- The foundation serves the purpose of completely distributing the load from the structure over a large base area and then to the soil underneath. This load transferred to the soil should be within the allowable bearing capacity of the soil.

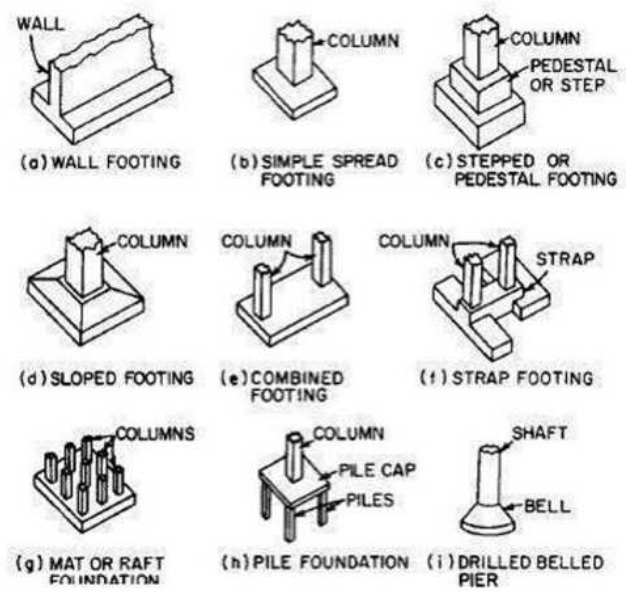
Based on the purposes of foundation in construction, the main functions of the foundation can be enlisted as below:

1. Provide overall lateral stability for the structure
2. Foundation serve the function of providing a level surface for the construction of substructure
3. Load Distribution is carried out evenly
4. The load intensity is reduced to be within the safe bearing capacity of the soil
5. The soil movement effect is resisted and prevented

Types of Foundation and their Uses

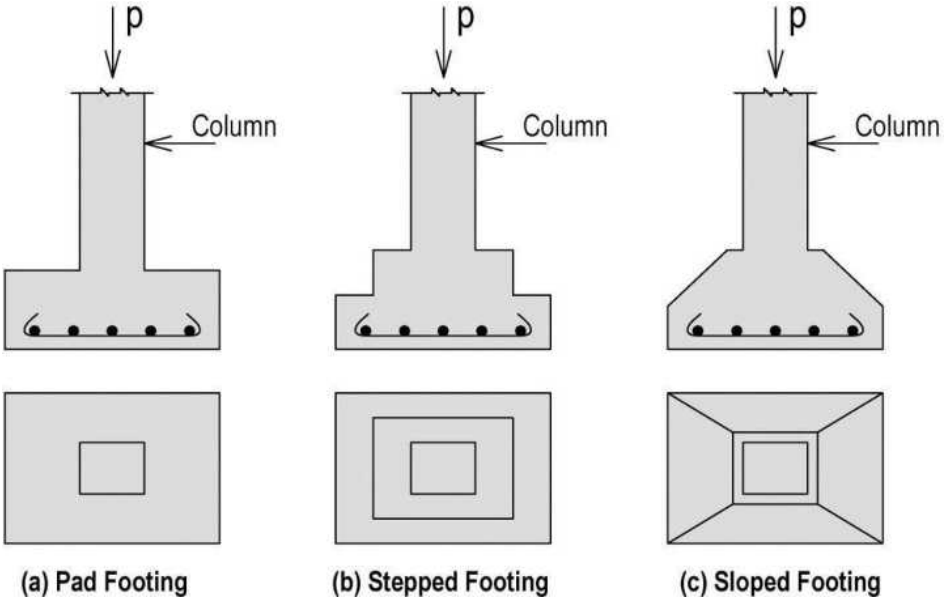
Following are different types of foundations used in construction:

1. **Shallow foundation**
    - Individual footing or isolated footing
    - Combined footing
    - Strip foundation
    - Raft or mat foundation
2. **Deep Foundation**
    - Pile foundation
    - Drilled Shafts or caissons



Types of Shallow Foundations

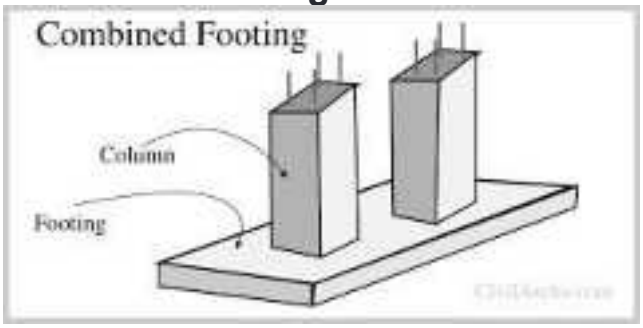
1. Individual Footing or Isolated Footing



Individual footing or an isolated footing is the most common type of foundation used for building construction. This foundation is constructed for a single column and also called a pad foundation.

The shape of individual footing is square or rectangle and is used when loads from the structure is carried by the columns. Size is calculated based on the load on the column and the safe bearing capacity of soil.

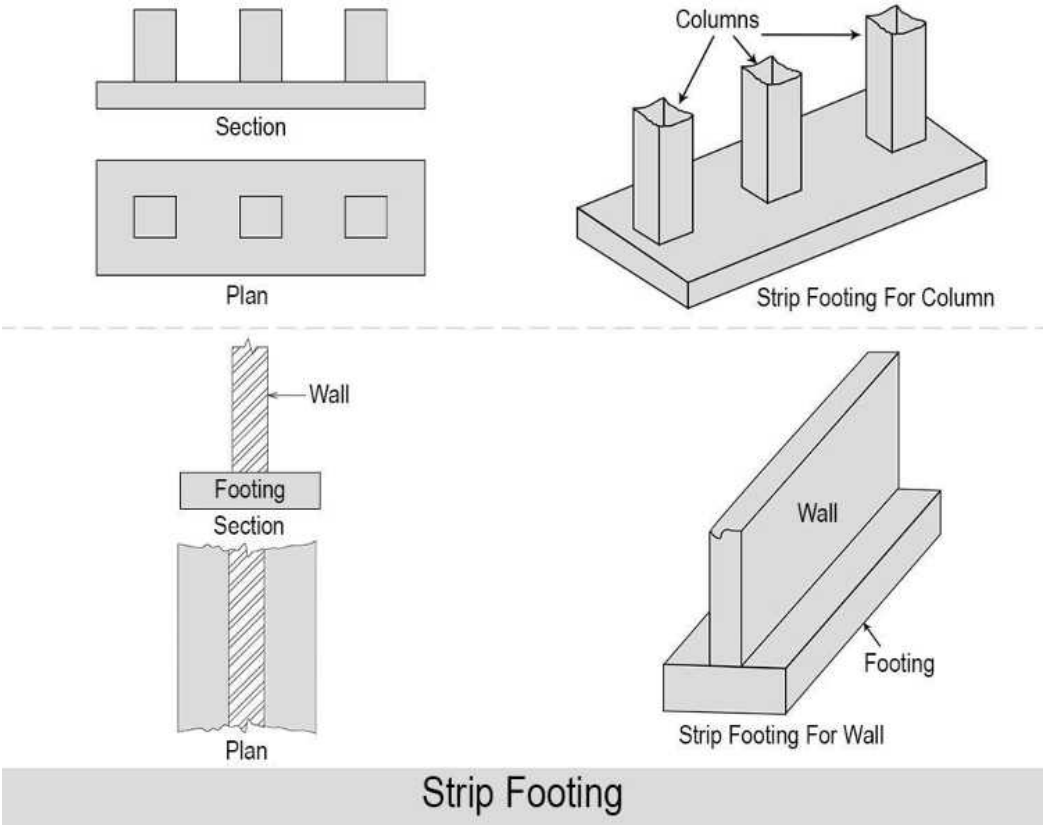
3. Combined Footing



Combined footing is constructed when two or more columns are close enough and their isolated footings overlap each other. It is a combination of isolated footings, but their structural design differs.

The shape of this footing is a rectangle and is used when loads from the structure is carried by the columns.

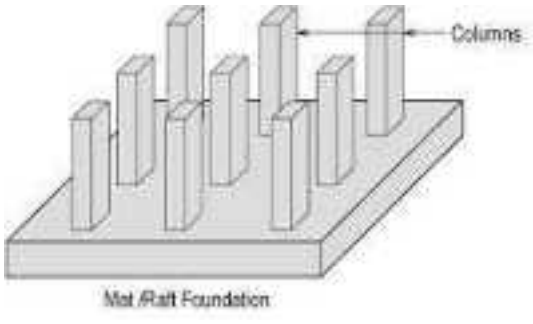
4. Spread footings or Strip footings and Wall footings



Spread footings are those whose base is wider than a typical load-bearing wall foundations. The wider base of this footing type spreads the weight from the building structure over more area and provides better stability.

Spread footings and wall footings are used for individual columns, walls and bridge piers where the bearing soil layer is within 3m (10 feet) from the ground surface. Soil bearing capacity must be sufficient to support the weight of the structure over the base area of the structure.
These should not be used on soils where there is any possibility of a ground flow of water above bearing layer of soil which may result in scour or liquefaction.

5. Raft or Mat Foundations



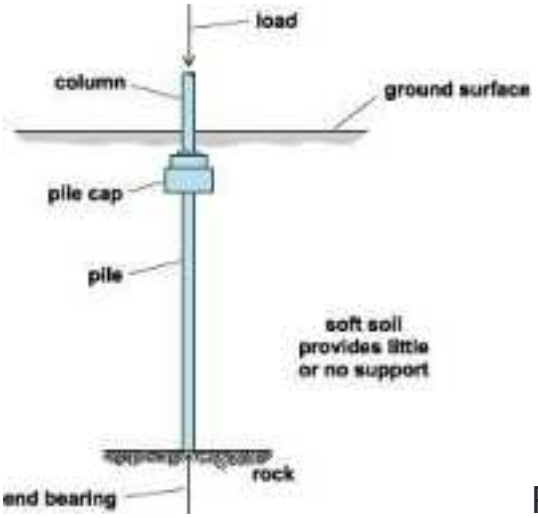
Raft or mat foundations are the types of foundation which are spread across the entire area of the building to support heavy structural loads from columns and walls.

The use of mat foundation is for columns and walls foundations where the loads from the structure on columns and walls are very high. This is used to prevent differential settlement of individual footings, thus designed as a single mat (or combined footing) of all the load-bearing elements of the structure.
It is suitable for expansive soils whose bearing capacity is less for the suitability of spread footings and wall footings. Raft foundation is economical when one-half area of the structure is covered with individual footings and wall footings are provided.
These foundations should not be used where the groundwater table is above the bearing surface of the soil. The use of foundation in such conditions may lead to scour and liquefaction.

Types of Deep Foundation

Pile Foundations

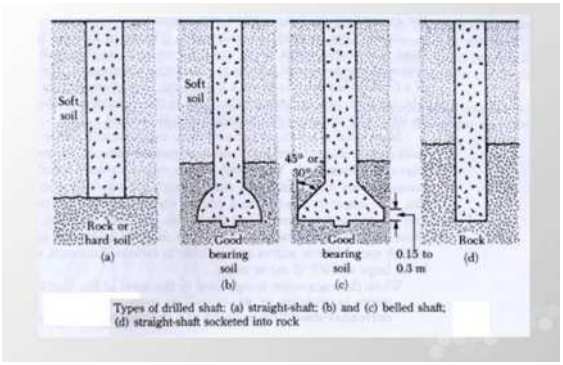
Pile foundation is a type of deep foundation which is used to transfer heavy loads from the structure to a hard rock strata much deep below the ground level.

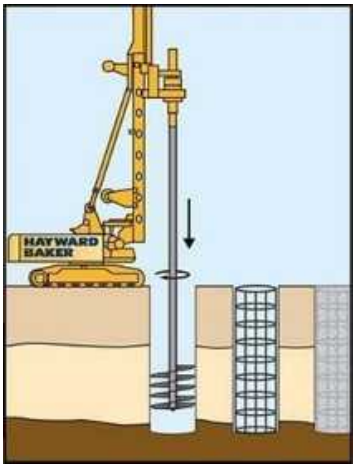


Pile Foundation

Pile foundations are used to transfer heavy loads of structures through columns to hard soil strata which is much below ground level where shallow foundations such as spread footings and mat footings cannot be used. This is also used to prevent uplift of the structure due to lateral loads such as earthquake and wind forces.
Pile foundations are generally used for soils where soil conditions near the ground surface is not suitable for heavy loads. The depth of hard rock strata may be 5m to 50m (15 feet to 150 feet) deep from the ground surface.
The use of pile foundations also prevents differential settlement of foundations.

Drilled Shafts or Caisson Foundation





Drilled shafts, also called as caissons, is a type of deep foundation and has an action similar to pile foundations discussed above, but are high capacity cast-in-situ foundations. It resists loads from structure through shaft resistance, toe resistance and/or combination of both of these. The construction of drilled shafts or caissons are done using an auger.

Fig: Drilled Shafts or Caisson Foundation (Source: Hayward Baker)

Drilled shafts can transfer column loads larger than pile foundations. It is used where the depth of hard strata below ground level is located within 10m to 100m (25 feet to 300 feet).

Drilled shafts or caisson foundation is not suitable when deep deposits of soft clays and loose, water-bearing granular soils exist.

Summary:

What are broad classifications of foundation?

Building foundations are broadly classified as shallow and deep foundations.

What are Types of Shallow Foundation?

Types of shallow foundations are individual footing or isolated footing, combined footing, strip foundation, raft or mat foundation.

What are Types of Deep Foundation?

Types of deep foundations are pile foundation and drilled shafts or caissons.

What are difference between pile foundation and drilled shafts?

Drilled shafts has an action similar to pile foundations but are high capacity cast-in-situ foundations. It can transfer column loads larger than pile foundations. It is used where the depth of hard strata below ground level is located within 10m to 100m (25 feet to 300 feet).

What are difference between isolated and combined footing?

Combined footing is constructed when two or more columns are close enough and their isolated footings overlap each other. It is a combination of isolated footings, but their structural design differs.

When is Raft or Mat Foundations used?

The use of raft or mat foundation is for columns and walls foundations where the loads from the structure on columns and walls are very high. Rafts are used to prevent differential settlement of individual footings, thus designed as combined footing of all the load-bearing elements of the structure.

STRUCTURAL SYSTEMS

Introduction

Structural systems are those elements of construction that are designed to form part of a building's structure either to support the entire building (or other built asset, such as a bridge or tunnel) or just a part of it. So, a steel frame is a structural system that supports the building and everything on it and in it. A space frame is a structural system that typically supports the roof.

Types of structural system

- *Wall-Bearing or Continuous structures or load-bearing structure*
- Framed structures
- Tensile structures
- Shell structures
- Space frame

Wall-Bearing or Continuous structures or load-bearing structure

Wall-bearing refers to a building type that relies on masonry walls to support floor and roof structural members. Also called A load-bearing structure is a structure in which loads are transferred to the foundation through walls. This type of structure doesn't have beams and columns. These comprise continuous supporting walls through which the combined loads and forces in a building are transferred, mainly by direct compression, into the subsoil through the foundations.. The load-bearing walls are constructed over a continuous foundation and they're designed to carry the complete load, including their load. Such structures generally are only one or two stories in height, but they can be higher if circumstances warrant.

Wall-bearing construction usually is found in fairly simple structures in which no major modifications are anticipated. They are rather easy to construct, but their floor plans are typically not as flexible as other building types

Framed structures

Timber, reinforced concrete and steel can all be used to create regular frameworks comprising beams and columns.
The beams transfer loads from roof, floors and walls to the columns.
The columns transfer the beam loads to the sub-soil through the foundations. The dead and imposed loads from roofs or floor slabs will be transferred to the floor beams and then to the structural frame.

External walls in framed buildings act as infill panels between columns and beams. Because they are non-load bearing (although they carry their own weight and must resist wind forces), they can be of any durable material that fulfils thermal, acoustic, fire and environmental criteria. When positioned on the outside of the frame they form a part of the building envelope and are known as cladding.

Shell structures

A shell is a three-dimensional solid structural element whose thickness is very small compared to its other dimensions structure that retains their size and support load, even without frame or solid mass material inside is called shell structure. A shell is a building that is hollow from within, these shell components are usually bent and formed into a massive frame, they are lightweight constructions using shell elements.

Shell Structure

These elements, typically curved, are assembled to make large structures. Typical applications include the roofs of large buildings. Materials range from concrete (a *concrete shell*) to fabric (as in *fabric structures)*

They are usually constructed of concrete reinforced with steel mesh. Thin parabolic shell vaults stiffened with ribs have been built with spans up to about 300 ft (90 m). More complex forms of concrete shells have been made, including hyperbolic paraboloids, or saddle shapes, and intersecting parabolic vaults less than 0.5 in. (1.25 cm) thick. Pioneering thin-shell designers include Felix Candela and Pier Luigi Nervi.

They are commonly used where a building interior needs to be free from intermediate walls or columns that might support a more conventional flat or pitched roof, such as; libraries, theatres, leisure centres, airport and railway terminals, and so on.

Because of their structural efficiency less material is generally needed compared to more traditional roofs.
Advantages of Shell structures

1. A light form of construction
2. Faster construction
3. An easy method of fabrication
4. Waste reduction as no requirement of fittings
5. Covers a large area
6. Aesthetic in appearance
7. Energy efficient
8. Lesser material usage

Types of Shell Structure

Here, the different types of shell structures are as follows.

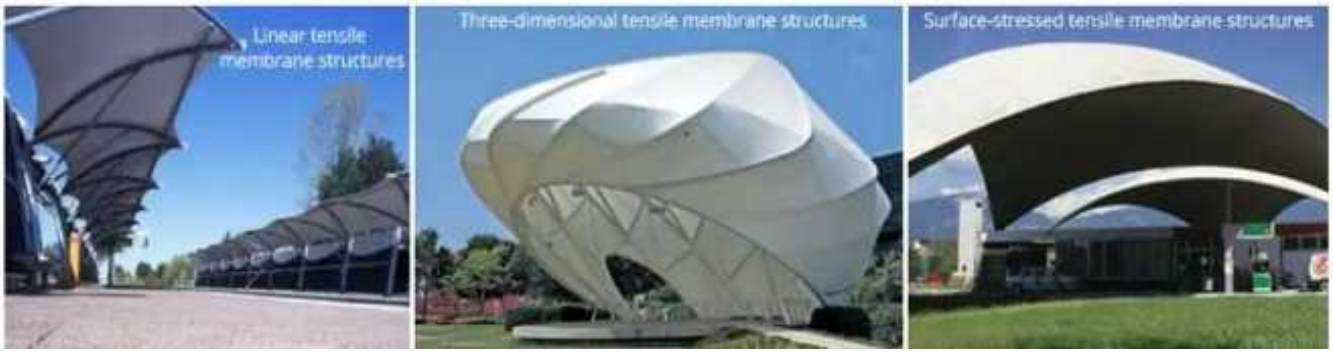
- Cylindrical Shell
- Multiple Cylindrical Shells
- North Light Shells
- Asymmetrical Cylindrical Shells
- Barrel Vaults
- Short Shells and Long Shells
- Domes
- Intersection Shell Structure
- Shell Arches
- Translation Shells

Tensile structures

Tensile structure is the term usually used to refer to the construction of roofs using a membrane held in place on steel cables. Their main characteristics are the way in which they work under stress tensile, their ease of pre-fabrication, their ability to cover large spans, and their malleability. This structural system calls for a small amount of material thanks to the use of thin canvases, which when stretched using steel cables, create surfaces capable of overcoming the forces imposed upon them.

A tensile structure is a structure elements carrying only tension and no compression or bending. A tensile membrane structure is most often used as a roof, as they can economically and attractively span large distances. These type of structure is commonly found in sports facilities, warehousing and storage buildings, and exhibition venues

Types of Tensile Structures



- . Linear Tensile Structures - Suspension bridges, Cable trusses

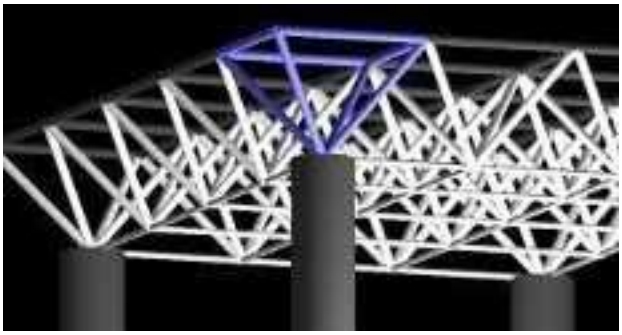
- Three-dimensional Tensile Structures - 3D cable trusses
- Surface-Stressed Tensile Structures - Fabric structure, Prestressed membranes. Pneumatically stressed membranes

Shapes of Tensile Structures

The four basic shapes used in the tensile structures are,

- Conical Tension Structure.
- Hypar or Anticlastic Structure.
- Parallel Arch or Barrel Vault Structure.
- Cable Net & Membrane Structure.

Space frame



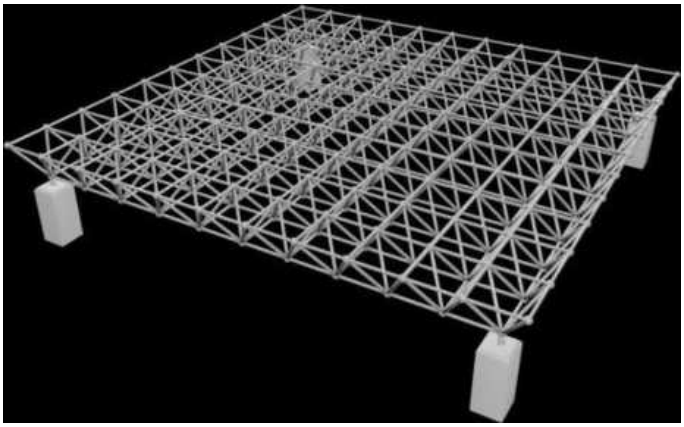
A space frame, also called a space structure, is a truss-like structure comprising of struts that are interconnected in a geometric pattern that is both strong and lightweight.

This is similar in concept to a space deck, but has
greater design and layout flexibility. Space frames are lightweight
rigid roofing systems consisting of a series of connectors that join together the chords (or struts) and bracing members. These structures are durable because of the triangle's intrinsic stiffness and the bending stresses transferred down the length of each strut as tension and compression.

Their strength derives from the rigidity of the triangle, with the flexing loads being transmitted as tension and compression loads along the length of each chord.
Most space frames are fabricated from structural steel or aluminium alloy tubes.

Buckminster Fuller pioneered the use of space frames in the 1960s for his geodesic dome structures.
Components of the Space Frame
Space frame structures are composed of various components, the most common of which is Linear Action Members and Node Connectors/Joints.

Types of Space Frames
Classification based on Curvature
1. **Space Plane Covers**
Spatial structures are mostly made up of planar substructures. The planes are channeled through the horizontal bars, while the diagonals are responsible for supporting the shear forces.



2. **Barrel Vaults**

The cross-section of barrel vaults resembles a simple arch, with tetrahedral modules or pyramids typically used as a unit component.

3. **Spherical Domes**

A spherical dome is constructed from an intricate network of steel sections. Typically uses tetrahedral modules or pyramids with skin support.

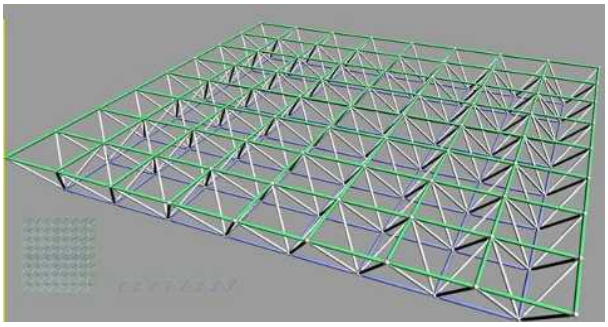
Classification based on the Arrangements of Dome Elements

1. **Single Layer Grid**

All elements are approximately positioned on the surface.

2. **Double-Layer Grid**

The space frame often utilizes frames of this sort. Elements are arranged in two parallel layers that are spaced at a specific distance away from each other. There are many diagonal bars connecting the nodes of both layers.



3. **Triple Layer Grid**

These are arranged in three parallel lines, with the diagonals connecting them. They are often flat and are mainly used in buildings with larger spans.

Applications of Space Frame Structure

1. Commercial and Industrial Buildings
2. Conference Hall
3. Auditoriums
4. Warehouses
5. Skylights
6. Shopping Malls
7. Canopies
8. Airports
9. Airplane Hangars
10. Toll booths
11. Exhibition Center
12. Sports stadiums

Advantages of Space Frame Structures

1. Because of their extreme sturdiness and lightweight nature, space frame structures provide the most precise load distribution.
2. Space frames benefit from being lightweight, mass-produced, stiff, and versatile compared to other common structures.
3. The space frame structures' prefabricated parts make installation relatively simple.
4. Space frame buildings are highly portable and manageable.

5. These kinds of buildings provide good cambering facilities.
6. Excellent acoustic qualities may be found in space frame constructions.
7. It is better suited for buildings with irregular plan shapes and sites.
8. Also appropriate for a larger-span construction.

ENCLOSURES

part of any building that physically separates the exterior environment from the interior environment(s) is called the building enclosure or building envelope. Dividing the outside environment from the interior, the building enclosure is one of the most important parts of the structure. The enclosure not only defines the building's aesthetic, but also protects occupants from the elements and facilitates a comfortable, controlled climate.

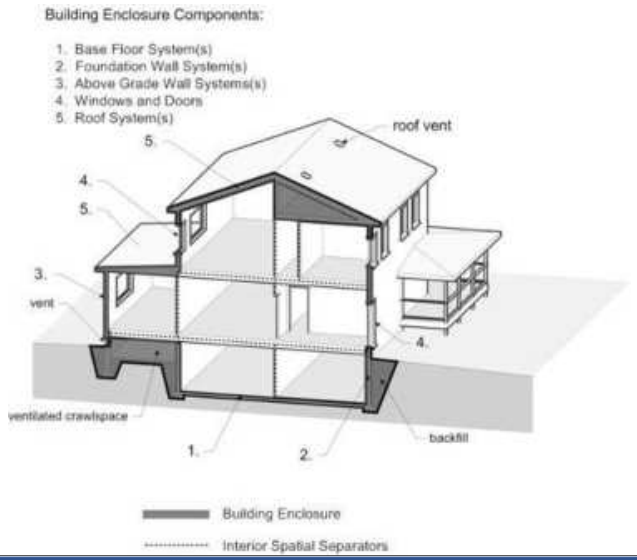
WHAT FEATURES ARE INCLUDED IN A BUILDING ENCLOSURE?

Building envelopes include several features, including the roof, the wall/windows above ground, the walls below ground and the base floor system. They include all of the layers of matter surrounding a building,

Enclosure Components

The primary function of the enclosure is to separate the interior environment from the exterior environment to which it is exposed. Physically, the typical building enclosure usually consists of the following components:

- the roof system(s)
- the above-grade wall system(s) including windows (fenestration) and doors
- the below-grade wall system(s), and
- the base floor system(s).

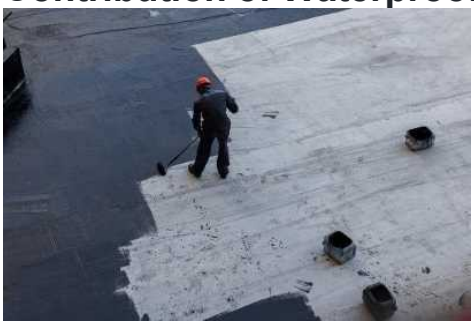


WEATHER PROTECTION

What is Waterproofing?

Waterproofing is the process of making an object or structure waterproof or water resistant. the insulated surface or structure resists water ingress.
In buildings, waterproofing creates a barrier to prevent water passage on surfaces that have high contact with water such as foundations, roofs, and walls.
waterproofing, building surfaces are strengthened and waterproofed.
waterproofing is a protective measure that makes a surface water-resistant and prevents liquids from penetrating undesirable surfaces under external forces such as hydrostatic pressure and capillarity.

Contribution of Waterproofing Materials to Building Durability



Every building faces durability issues if proper precautions are not taken. In this way, natural factors such as air, water, climate, wind, and humidity affect the durability of the building.
If a building is not protected against liquids coming from external factors, problems such as deterioration or damage to many different surfaces, from foundation to exterior, may be encountered.
Waterproofing is a process designed to prevent liquids from entering a structure. Comprehensive waterproofing measures are often added to the building to provide moisture control during construction, and waterproofing materials are applied after the structure is built to eliminate any problems that may be encountered.
At the same time, waterproofing reduces internal humidity, makes the building more comfortable, and prevents objects inside the building from being damaged by moisture and water vapor.

What are Waterproofing Materials?

Waterproofing materials, which are one of the most important elements of a building project, increase the durability of many different surfaces in construction.
Each of the products has different usage areas. If the correct type of waterproofing material is not applied to the surfaces, the problems that will be encountered not only reduce the comfort of living spaces but also reduce the durability of the structure. For this reason, it is imperative to apply the right insulation material to surfaces that are in high contact with water.

1. Cement Based Waterproofing Materials

Cement-based waterproofing is the easiest waterproofing method used in construction projects. It is easy to apply by mixing cement-based waterproofing materials.
This method is generally used in areas that are in the interior of the building and have high contact with water, such as toilets and bathrooms.
This method is generally used in areas exposed to high pressure such as pools and water tanks, and in humid places with high contact with water such as terraces, bathrooms, and basements. Cement-based waterproofing usually has full or semi-resilience but is not exposed to sunlight and weather conditions as it is used in areas such as toilets and bathrooms.

2. Liquid Waterproofing Membrane Materials

. The liquid waterproofing membrane method is a thin coating, usually consisting of a primer coat and two coats applied by spray, roller, or trowel. It offers more flexibility than cement-based waterproofing types. For this reason, it is used more intensively today.
The durability of the waterproofing coating depends on what kind of polymer the manufacturer uses in the construction of liquid waterproofing.

3. Liquid Bituminous Membrane Waterproofing Materials

Liquid bituminous coating is a type of coating used for waterproofing and flexible protective coating in accordance with its formulation and degree of polymerization. Its flexibility and protection against water can be affected by the quality of the polymer grade as well as the fiber from which it is produced.
Liquid bituminous pavement is also called asphalt pavement. The most common applications of liquid coatings include areas under the screed. It is an excellent protective coating and waterproofing material, especially on surfaces such as concrete foundations.

Liquid bitumen coating is made using bitumen rubber-based materials and is used on all horizontal and vertical surfaces. It is preferred for external insulation of areas such as foundations, cellars, and basements, and for the isolation of closed areas in the interior of the house such as bathrooms, kitchens, and toilets.

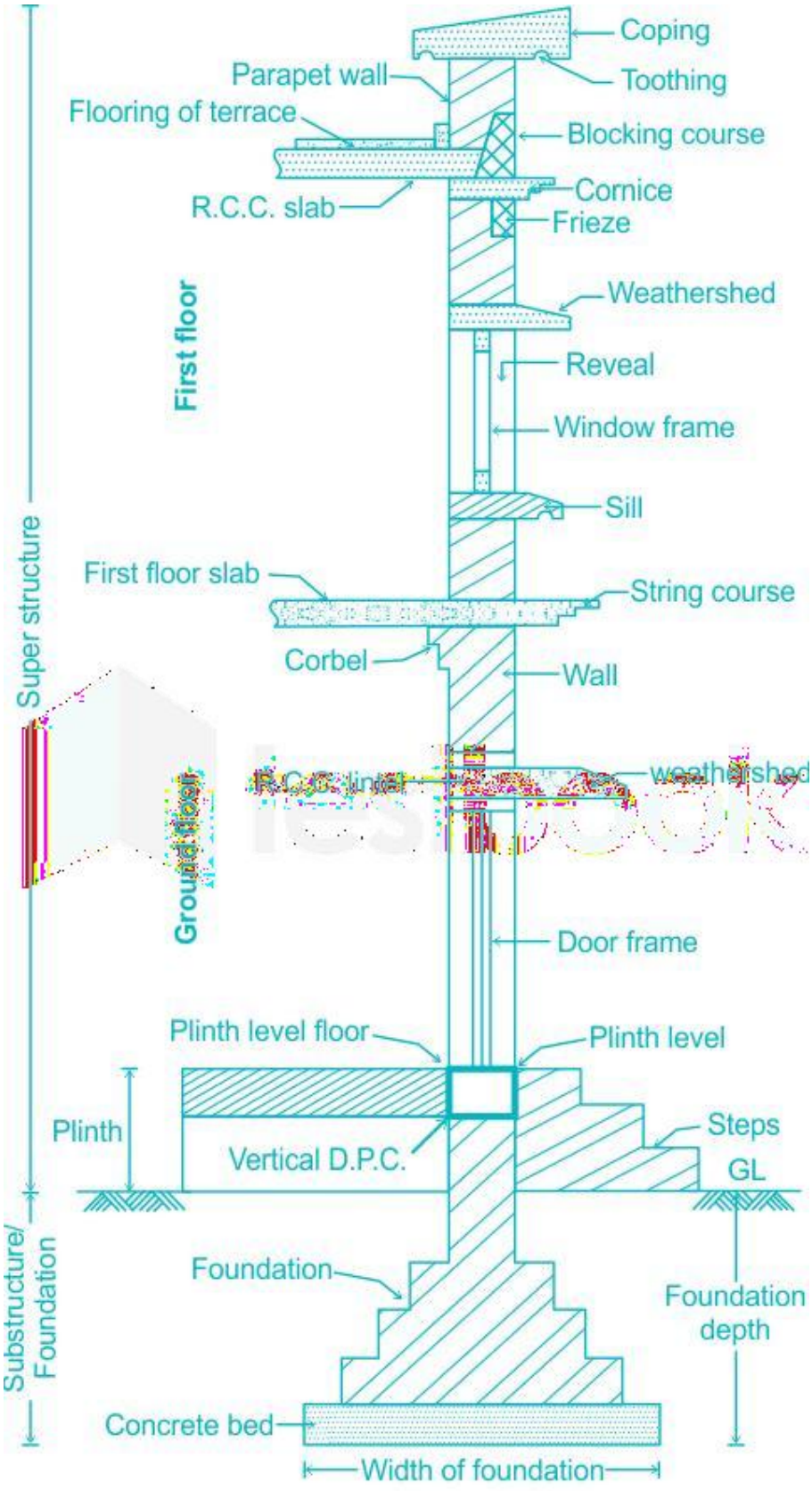
4. **Membrane Waterproofing Materials**

Membrane waterproofing materials are one of the most preferred waterproofing materials in the construction industry. This material; is also very preferred in roof insulation applications with its ease of use, and price/performance advantage.
It is used under the coating in wet areas such as terraces and sloping roofs, balconies, flower beds, garden terraces, retaining and basement walls, sewage treatment plants, water tanks, ponds, swimming and ornamental pools, kitchens, bathrooms, WCs. It is also used in areas such as gardens and terraces that come into contact with the soil.

5. Polyurethane Liquid Membrane Waterproofing Materials

The polyurethane liquid membrane waterproofing method is used for the flat roof area and provides insulation of the roof against external factors. Highly flexible polyurethane liquid membranes are designed not to be affected by external factors. the most accurate waterproofing required on exterior surfaces such as balconies, terraces, and roofs.

UNDERSTANDING BUILDING COMPONENTS AND THEIR NOMENCLATURE WITH SKETCHES



Components of a building

Components Of A Building:

A building can be divided into two general categories

1. Sub-Structure:

It is the portion of a building situated underneath the surrounding ground.

2. Superstructure:

The portion which is situated above the ground level is called superstructure.

The basic Components of a Building Structure are the Footing, Column, Beam, Slab, Lintel, Doors, Windows, Sill, and DPC. Earth Filling, Parapet Wall, etc.

These parts of the building serve the purpose of supporting, enclosing, and protecting the building structure.

- **Components of Building**
    - 1. Foundation
    - 2. Plinth Level
    - 3. Earth Filling
    - 4. DPC (Damp Proof Course)
    - 5. Flooring
    - 6. Walls
    - 7. RCC Column
    - 8. Sill Level
    - 9. Lintel
    - 10. Ceiling
    - 11. Chhajjas
    - 12. RCC Beam
    - 13. Roof or RCC Slab
    - 14. Doors
    - 15. Windows
    - 16. Parapet Wall
    - 17. Waterproofing on the Terrace
    - 18. Copping

1. **Foundation**

A Foundation is the lowest part of the building structure resting on soil below ground level. All loads of building are transferred to the foundation through beam and column arrangement.

Its main function is to distribute the load evenly and safely to the ground.

In framed structures, Footings are generally used as foundations to support the structural load of the building.
The following are various types of foundations and footings used in construction:

1. Shallow foundation
    - Individual footing or isolated footing
    - Combined footing
    - Strip foundation
    - Raft or mat foundation
2. Deep Foundation
    - Pile foundation
    - Drilled Shafts or caissons
3. Standard Dimensions
4. Foundation size and depth totally depend on the structural and site ground condition. So, there are no standard dimension recommendations for it.
5. But, For small structures like row houses depth of the foundation should be at least 1.5 m from ground level.

2. **Plinth Level**

The Plinth level or Plinth is the offset created between ground level and the superstructure of the ding. It is made by constructing a brick wall from ground level to the ring level of the building.
Its main function is to prevent the entry of moisture from the ground surface to the building superstructure.
Standard Dimensions
The plinth height of any building must be at least 45 cm or 3 feet from the ground level

3. **Earth Filling**

An Earth Filling or Soil Filling is done between the plinth wall. It is essential to fill the open space left between the ground level to the plinth level.
Earth filling must be very well compacted so that the flooring gets a sufficiently hard surface base.
Standard Dimensions:

Earth must be filled to the top of the plinth level. Different materials can utilize as earth fills like soil, coarse aggregate, waste materials, Brick Bat, etc.

DPC (Damp Proof Course)

DPC is a layer of waterproofing material such as asphalt or waterproof cement at the plinth level.

The superstructure walls are constructed above the DPC layer so that no dampness rises from the ground surface into the walls.

In short, DPC prevents the rise of water to superstructures.

If dampness rises in the wall of the superstore it reduces the strength of the walls and creates unhealthy living conditions.

Also, it created many defects in paint and plaster and ultimately increases maintenance costs.

In the case of Plinth, beams are provided above ground level DPC is not required. Because the plinth Beam itself performs as a DPC layer to restrict the entry of dampness

Standard Dimensions

Generally, DPC is laid on brick masonry construction up to the plinth level. So the width of DPC is the same as the width of the Brick wall and thickness may vary from 2.5cm to 5cm.

5. Flooring

Flooring is an important component of the home. It is one that provided an attractive and pleasant look to the house. Flooring is made by laying tile on it.

There are different types of flooring designs and materials available,

- Timber Flooring
- Laminate Flooring
- Vinyl Flooring
- Porcelain or Ceramic Tile Flooring
- Natural Stone Flooring – Marble, Granite, etc.

Standard Dimensions

Flooring is provided above the earth filled with a base made of cement concrete (1:2:4). The flooring material should have sufficient thickness and strength.

6. Walls

Walls are the vertical component of any structure. It can be constructed using stones, bricks, concrete blocks, etc. Different types of bonds are used for constructing walls.

Bricks walls are essential to enclose the inside area and protect against wind, sunshine, rain, etc. Doors and Windows are provided in the walls for ventilation and access to the building.

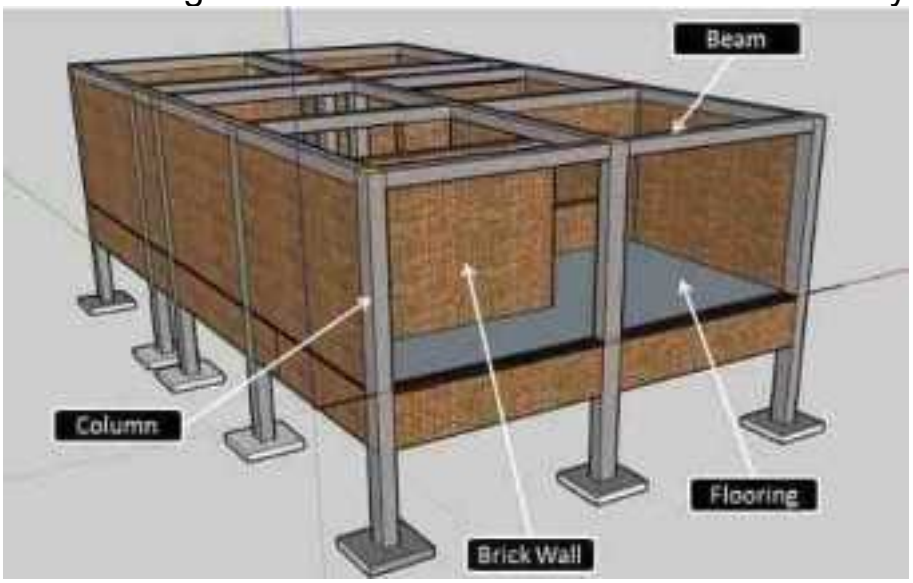
Standard Dimensions

Walls may be made of single brick walls or double brick walls. The single brick wall has a thickness of 100 mm and the Double brick wall has a thickness of 230mm.

7. RCC Column

Columns are vertical members constructed to support any structural frame. Load Coming from the Slab, Beam transferred to column and column transfer load to the footing safely. Building structures may have two types of columns.

Architectural columns and structural columns. Architectural columns primly used to increase the aesthetic appearance of a building while a structural column takes the load coming from the slab above and transfers it safely to the foundation.



Standard Dimensions

Columns may have various sizes as per the structural load requirements. But, for minimum dimension for any structural column is restricted to 9” x 9” or 225mmx225mm.

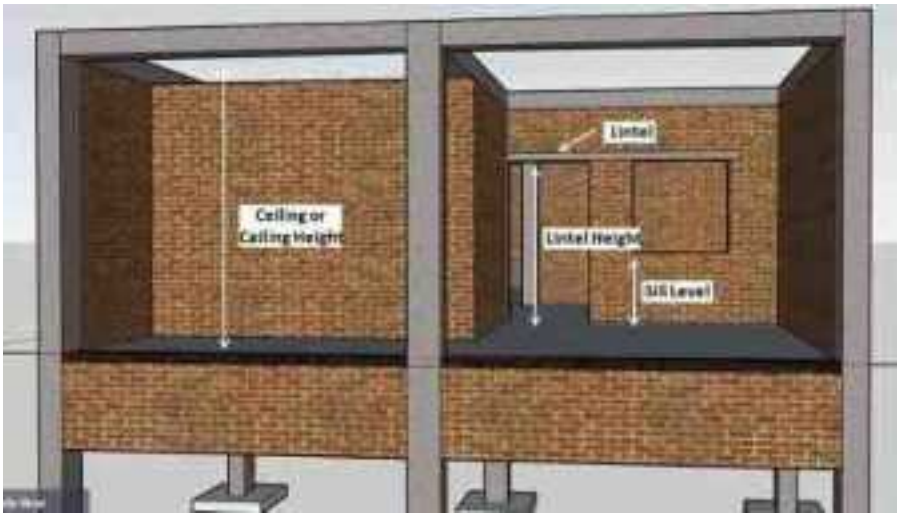
8. Sill Level

It is the base point of any window in the house or it is a level where windows are placed. The Sill level is very important to ensure evenness in all window levels.

A sill is a height which is ensuring that the proper amount of light enters the house. It also provides easy habitat to look outside through the window without any discomfort. It provides a solid base for window installment.

Standard Dimensions:

The sill level of any house should be around 3 ft or 900 mm.



9. **Lintel**

Lintels are constructed from reinforced cement concrete. It is provided above the wall openings like doors, windows, etc. The Lintel actually takes the load coming on window and door openings.

In Sort, the lintel safeguards the door and window from excess load coming from above. In residential buildings, lintel can be constructed from concrete or brick masonry.

Standard Dimension

Generally, the lintel width is as same as the width of the wall, and the thickness is between 4” to 6”

10. Ceiling

The ceiling is not a separate part but is the bottom face of any slab. The ceiling is the most important part of any room because it can be decorated to increase the aesthetic appearance. POP (Plaster of Paris) is a material used for making false ceilings.

It is a location where we can hang decorative items, fans, etc to increase the architectural view of the room.

Standard Dimension

The ceiling height is kept from 9’ 6” to 10’ 6”. (it can be more or less as per requirement)

11. **Chhajjas**

Chhajjas is also called a Weather shed. This is a structure that is constructed above the window and projected outside from the window face.
The main function of the weather shed is to restrict the direct entry of rainwater and sunlight. Chhajjas are constructed from reinforced cement concrete.
Standard Dimensions
Length of Chhajjas = Width of Window + 0.15m Bearing on both Side
Width of Chhajjas = 0.45 m to 0.60 m.

12. **RCC Beam**

RCC Beam is an important component in any frame structure. The beam is a horizontal member which connects columns on both sides.
Its main function is to take the load from the upper structure and transfer it to the column.
Generally, the column-to-beam connection is called direct support while the beam-to-beam connection is called indirect support.
In most cases, the beam is supported by two columns, and the most rarely used is the cantilever beam.
Standard Dimension
Beam minimum dimension is 9” x 9” (Thumb Rule)

13. Roof or RCC Slab

The roof is an essential structural component of building any structure, which provides protection again environmental factors like sun, wind, and rain. Generally, All roof rests on sidewalls and required anchoring so that wind and another mechanical impact cannot destroy them.
Roofs may have different shapes, but flat and sloped roofs are more popular. Typically most roofs are constructed from RCC, stone slabs, tiles, etc.
Standard Dimension
Generally, RCC Slab Thickness can have a minimum dimension of 4” to 6” as per requirement.

14. Doors

Doors are the main entry and exit points of any house. Without doors, there will be no security in the house. They are the ones that separate one room from the others. Doors have a lock-key facility, so we can lock the house by locking the door and going out freely. They are made of strong materials like steel, wood, and iron. Therefore, they are not easily breakable.
There are different types of doors used in the house,

1. Hinged Doors
2. Dutch Doors
3. Roller Doors
4. Bifold Doors
5. Sliding Doors
6. Pivot Doors
7. French Doors
8. Panel Doors
9. PVC Doors
10. Flush Doors

Standard Dimension
The main door of the drawing room, bedroom, the kitchen may have a width up to 2’6” to 3’, and in other rooms like the bath, W/C is 2’ to 3’. The height of the Doors is almost 7’ every time or up to the lintel level.

15. Windows

Windows are one of the essential components of any house or building. It is one that allows fresh air and light to enter the house. Without the window, the house becomes a darkroom or jail.
Windows are provided at sill level and their height is extended up to lintel level.
There are various types of windows used in houses like

1. Single Hung Windows
2. Arched Windows
3. Awning Windows
4. Bay Windows
5. Bow Windows
6. Casement Windows
7. Garden Windows

8. Glass Block Windows
9. Round Circle Windows
10. Skylight Windows
11. Sliding Windows
12. Transom Windows

Standard Dimension

Window opening width may change depending on requirement but its height is generally kept at 1.4m from sill level or up to the bottom of the lintel.

16. Parapet Wall

it is a low-height wall built along the edge of the roof, terrace, walkway, balcony, etc. Parapet walls can be constructed using different materials like reinforced cement concrete, steel, aluminum, glass, etc. It is generally constructed with a single brick wall.

Standard Dimensions:

The parapet wall height is 3 ft or 0.90 m.

17. **Waterproofing on the Terrace**

The damp proof course is the protective layer to restrict the movement of moisture, and water through the roof slab.

For DPC on the roof flexible materials are used which provide a lesser number of joints like mastic, asphalt, bitumen felts, plastic sheets, etc.

18. Copping

Coping is a structure that is constructed on top of Boundary walls & parapet walls etc. to protect rainwater directly store on brick masonry walls.
The main function of coping is to drain off rainwater during the rainy season & improve the aesthetics of the structure/wall.

19. Stairs:

Stairs can be defined as a structure comprising a number of steps arranged in a series connecting one floor to another. Stairs are used to access various floors of the building

20. Building Finishes:

Building finishes include items like plastering, pointing, washing, varnishing, painting, distempering, etc.

21. Building Services:

Building services include services like water supply, drainage, lighting, sanitation, electricity, acoustics, ventilation, heating, air conditioning, fire detection, and control, etc.

BASIC TYPES OF CONSTRUCTION SUCH AS LOAD BEARING/FRAMED/SPACE STRUCTURE

Wall-Bearing or Continuous structures or load-bearing structure

Wall-bearing refers to a building type that relies on masonry walls to support floor and roof structural members. Also called A load-bearing structure is a structure in which loads are transferred to the foundation through walls. This type of structure doesn't have beams and columns. These comprise continuous supporting walls through which the combined loads and forces in a building are transferred,

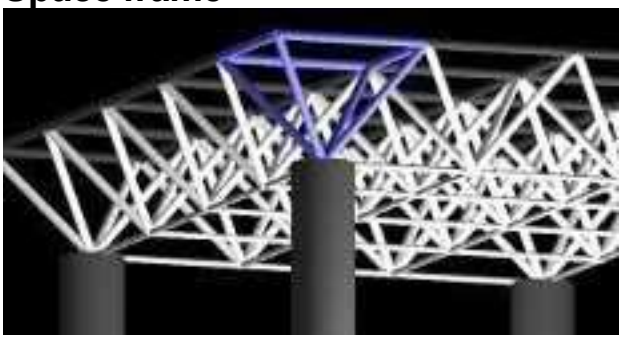
mainly by direct compression, into the subsoil through the foundations.. The load-bearing walls are constructed over a continuous foundation and they're designed to carry the complete load, including their load. Such structures generally are only one or two stories in height, but they can be higher if circumstances warrant.
Wall-bearing construction usually is found in fairly simple structures in which no major modifications are anticipated. They are rather easy to construct, but their floor plans are typically not as flexible as other building types

Framed structures

Timber, reinforced concrete and steel can all be used to create
regular frameworks comprising beams and columns.
The beams transfer loads from roof, floors and walls to the columns.
The columns transfer the beam loads to the sub-soil through the foundations. The dead and imposed loads from roofs or floor slabs will be transferred to
the floor beams and then to the structural frame.

External walls in framed buildings act as infill panels between columns and beams. Because they are non-load bearing (although they carry their own weight and must resist wind forces), they can be of any durable material that fulfils
thermal, acoustic, fire and environmental criteria. When positioned on the outside of the frame they form a part of the building envelope and are known as cladding.

SPACE STRUCTURE
Space frame



A space frame, also called a space structure, is a truss-like structure comprising of struts that are interconnected in a geometric pattern that is both strong and lightweight.

This is similar in concept to a space deck, but has
greater design and layout flexibility. Space frames are lightweight
rigid roofing systems consisting of a series of connectors that join together the chords (or struts) and bracing members. These structures are durable because of the triangle's intrinsic stiffness and the bending stresses transferred down the length of each strut as tension and compression.

Their strength derives from the rigidity of the triangle, with the flexing loads being transmitted as tension and compression loads along the length of each chord. Most space frames are fabricated from structural steel or aluminium alloy tubes.

Buckminster Fuller pioneered the use of space frames in the 1960s for his geodesic dome structures.

Components of the Space Frame

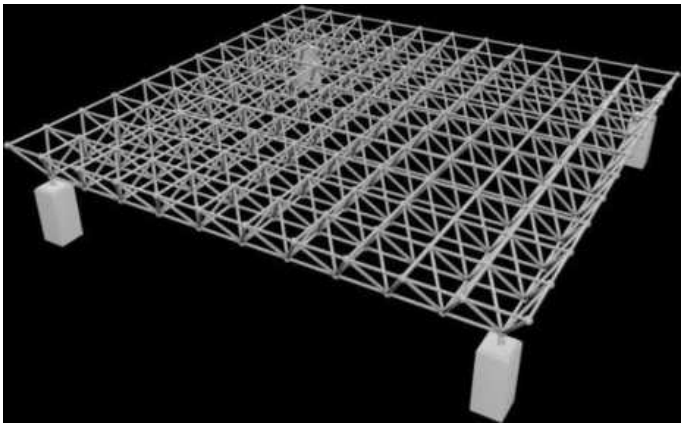
Space frame structures are composed of various components, the most common of which is Linear Action Members and Node Connectors/Joints.

Types of Space Frames

Classification based on Curvature

1. Space Plane Covers

Spatial structures are mostly made up of planar substructures. The planes are channeled through the horizontal bars, while the diagonals are responsible for supporting the shear forces.



2. Barrel Vaults

The cross-section of barrel vaults resembles a simple arch, with tetrahedral modules or pyramids typically used as a unit component.

3. Spherical Domes

A spherical dome is constructed from an intricate network of steel sections. Typically uses tetrahedral modules or pyramids with skin support.

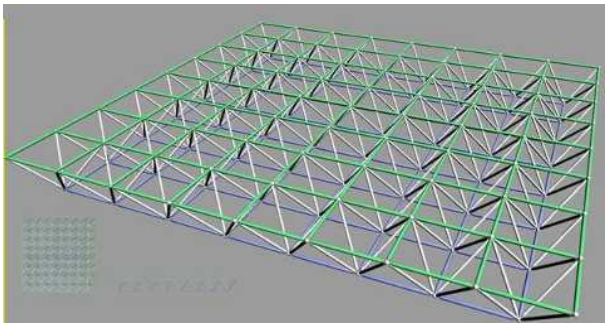
Classification based on the Arrangements of Dome Elements

1. Single Layer Grid

All elements are approximately positioned on the surface.

2. Double-Layer Grid

The space frame often utilizes frames of this sort. Elements are arranged in two parallel layers that are spaced at a specific distance away from each other. There are many diagonal bars connecting the nodes of both layers.



3. Triple Layer Grid

These are arranged in three parallel lines, with the diagonals connecting them. They are often flat and are mainly used in buildings with larger spans.

Applications of Space Frame Structure

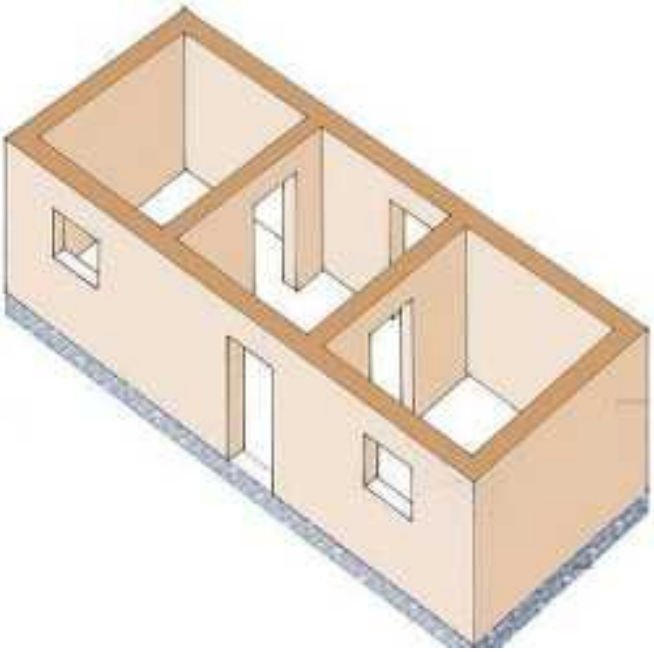
- Commercial and Industrial Buildings
- Conference Hall

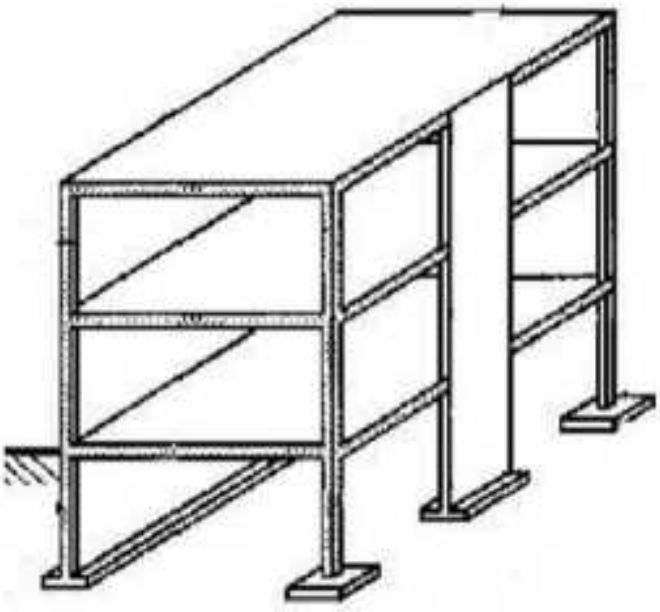
- Auditoriums
- Warehouses
- Skylights
- Shopping Malls
- Canopies
- Airports
- Airplane Hangars
- Toll booths
- Exhibition Center
- Sports stadiums

Advantages of Space Frame Structures

- Because of their extreme sturdiness and lightweight nature, space frame structures provide the most precise load distribution.
- Space frames benefit from being lightweight, mass-produced, stiff, and versatile compared to other common structures.
- The space frame structures' prefabricated parts make installation relatively simple.
- Space frame buildings are highly portable and manageable.
- These kinds of buildings provide good cambering facilities.
- Excellent acoustic qualities may be found in space frame constructions.
- It is better suited for buildings with irregular plan shapes and sites.
- Also appropriate for a larger-span construction.

Difference between load bearing and framed structure





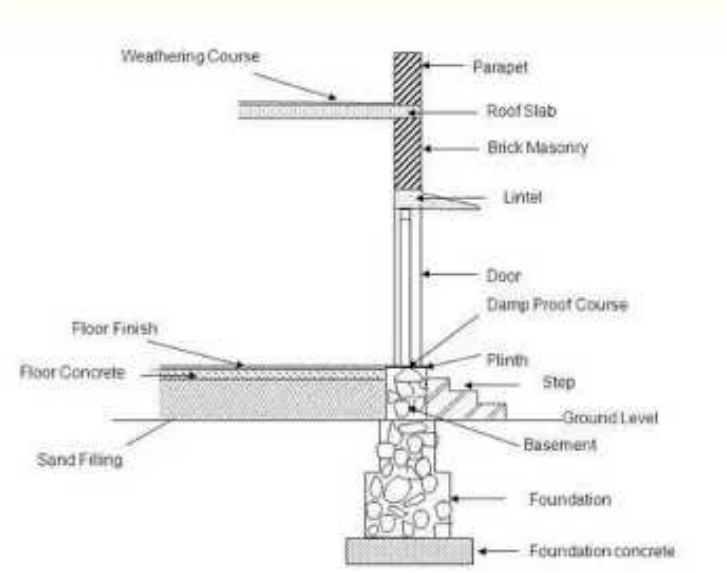
Load Bearing Structure vs Framed Structure

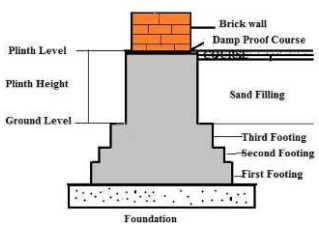
	Load Bearing Structure	Framed Structure
Definition	it is the structure in which the loads of the roofs as well as lateral loads such as earthquake, wind etc. are borne by walls, and through walls they are transferred to lower floor and eventually to foundations. It is also known as wall bearing structure.	A framed structure is a structure having the combination of structural components i.e. beam, column and slab connected together to resist the gravity and different lateral loads. These structures are generally used to overcome the large forces, moments developing due to the applied loads. It is also known as beam column structure.
Components	Load bearing structure consists of heavy masonry walls of brick or stone that support the entire structure.	Framed structure consists of beam, column, and slab.
Load Transfer Path	In load bearing structure, vertical load transfer path is from slab/floor to walls and walls to load bearing footing i.e. soil.	In a framed structure, vertical load transfer path is from slab/floor to beams, beams to columns and columns to load bearing footings and then to soil.
Height of Structure	Limited storey buildings can only be constructed.	Multi storey buildings of any heights can be constructed.
Resistant to Earthquake	Load bearing structures are poor resistant to earth quake, as they are constructed with masonry units like stone, brick bonded	Framed structure is more rigid and more resistant to Earthquake as entire frame made of column, beam and

	together.	slabs act as one unit.
Thickness of Wall	In load bearing walls are thicker.	In framed structure all the walls are thinner.
Carpet Area	In these types of structures less carpet area is available, as walls are thicker and hence carpet area efficiency of planning is less.	In these types of structures more carpet area is available, as walls are thinner.
Popularity	Rarely used form of construction at present. The load bearing walls are the earliest form of construction known to the civilization.	Most used form of construction.
Material Required	It is more material intensive. Hence dead load is also more. It consumes less cement and steel.	It is less material intensive. It consumes more cement and steel.
Worker Required for Construction	Skilled as well as non-skilled worker can construct.	Only skilled workers are needed for its construction.
Uniformity of Wall	Thickness of wall cannot be maintained uniform throughout. Thickness of wall increases with increase in height. Hence plan dimension changes on all floor.	Thickness of wall can be maintained uniform throughout. Thickness of wall remains same with increase in height. Hence plan dimension does not change on different floor.
Room Dimension	Room dimensions cannot be changed as walls have to be above walls only	Room dimension can be altered.
Feasibility of Cantilever	Inclusion of Cantilever	Cantilever elements can

Elements	element is difficult task in this system. Also, it is permitted up to short span only.	be easily provided in this system.
Span in Structure	In case of a load bearing structure, large span areas are not possible. Limitation of span i.e. room sizes.	In case of a framed structure, large span areas are possible. No Limitation of span i.e. room sizes.
Materials for Construction	Load bearing walls can be from Brick, Stone, concrete block, etc.	Frame can be of RCC frame, Steel, Wooden, etc.
Opening in Wall	Limitations for providing openings in walls, which will affect the light and ventilation in room.	Large openings in walls are possible.
Design Complexity	Design of load bearing structure is simple.	Design of framed structure is not simple as compared to load bearing structure. You need design skills and software tools.

PLINTH





What is the Purpose of Plinth?

A plinth level forms the foundation of a building. It is a rectangular block of stone on which a column and pillar of a building stands. It is a wall between the ground level and the ground floor level. Column bears the weight of the building's structure but all this weight presses down on the column. The main function of a plinth in construction is to distribute the load of the columns over the foundation evenly.

the most important advantages of plinth

- It evenly distributes and disperses the load of the columns to the foundation evenly
- It acts a barrier or a retaining wall that keeps the concrete filled ground floor below the raised floor of the building
- The plinth doesn't allow the dampness and moisture of the ground floor to reach the building's top structure
- In framed structure houses and buildings plinth beams are used as a barrier for protection from water seepage. Plinth protects the rest of the house from dampness, mold and mildew. It is a kind of waterproofing sheet laid above the ground floor level to protect the house from any damage because of added moisture
- Gives strength and durability
- Provides a better aesthetic appeal to the building
- It also prevents cracks in the building when the foundation suffers from settlement

DIFFERENCE BETWEEN PLINTH LEVEL, SILL AND LINTEL LEVEL

- There are three basic structural levels when constructing a residential unit. The plinth, sill and the lintel levels.

Plinth Level	Sill Level	Lintel Level
Part of the structure between the ground and the raised floor of the house	It is between the base of the window and the portion above the ground floor	The level between the top portion of the window and the top slab is called the lintel level
It is part of the flooring of the house and forms the basic foundation of a building	It is part of the window and is provided between the bottom of the window frame and the wall below	The frame of the window or door can not bear the weight of the wall and therefore a structural element is introduced to disperse the weight of the wall evenly which is known as lintel

WALLS

A **wall** is a structure and a surface that defines an area; carries a load; provides security, shelter, or soundproofing; or, is decorative. There are many kinds of walls, Walls in buildings that form a fundamental part of the superstructure or separate interior rooms,

The house is enclosed by outer walls for protection, while inner walls divide the enclosure into the needed number of rooms. Outer walls are also referred to as exterior walls, while inner walls are referred to as interior walls or partition walls.

walls can be composed of a variety of materials such as glass, wood, plywood, cinder blocks, steel sheets, and so on. As a result, depending on the material used to construct the wall, it can be classified into a variety of categories.
. There are various types of walls used in the construction of buildings

Types of Walls

Following are various types of walls used in building construction:

1. ***Load Bearing Walls***

Load bearing walls are walls which carry the total weight of the structure above by transferring the load to the foundation. In simple words the entire building rests on the walls rather than the columns.

Types of Load Bearing Walls

Followings are the types of load bearing walls:

- **Precast Concrete Wall**: This wall is aesthetically pleasing. The precast wall has superior strength and known for its durability. It provides excellent protection and is easy to install.
- **Retaining Wall**: It provides lateral support. Installing a retaining wall has many environmental benefits like reducing erosion and protecting areas from being saturated. It is also known as **revetment or breast wall**.
- **Masonry Wall**: Masonry is the most durable part of any structure. It allows for unlimited architectural expressions. They provide strength durability. Masonry wall also helps to control the temperature in indoor and out. Also, it increases the fire resistance. Lateral stiffness of the masonry wall is very low.
- **Pre Panelized Load Bearing Metal Stud Walls**: It is used for building exterior wall cladding. The metal can be stainless steel, copper, aluminum. It supports gravity, seismic and wind loading.
- **Engineering Brick Wall**: It uses double open-ended bond beam blocks. It is built using a mold. Block wall is replaced horizontally.
- **Stone Wall**: It is treated as a stone structure. It is kinda masonry construction. This wall provides structure to a building and encloses an area.

Precast wall:

it is a ready-made wall where the wall is cast in the factory and bought to site to install it. Specified the length and height of the wall. The wall is cast and transported to the site. This type of wall is preferred where there is limited to space to work and where there is less chance of labour..

4. Retaining Wall

Retaining walls act as a supporting element, allowing the soil to be restrained to a slope that would not usually keep it stable on a steep or vertical slope. Depending on the requirements, the main goal of erecting a retaining wall at a specific place is to hold soil behind it.

Small landscape stone walls to encircle a garden to massive soil-retaining installations along a roadway covering mountainous sections are all examples of walls. The various types of retaining walls are:

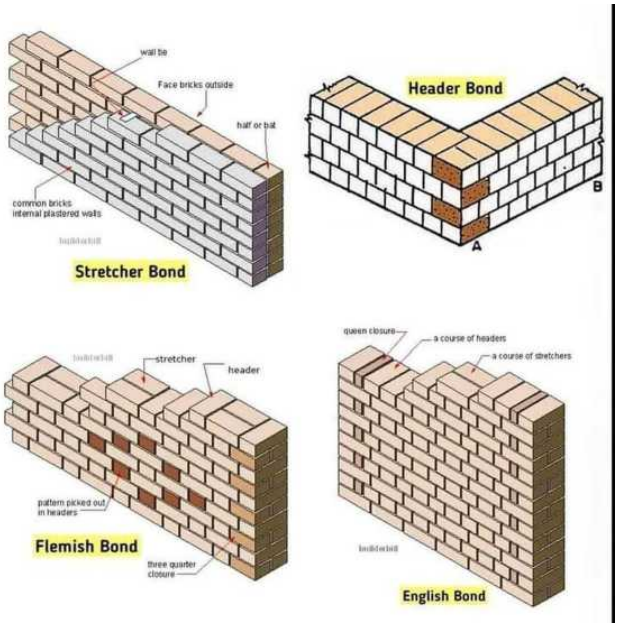
- Gravity retaining wall,
- Reinforced Concrete retaining wall,
- Brick masonry retaining wall,
- Anchored earth wall,
- Stone made Retaining wall.

Brick Masonry Wall

Brick is a versatile and long-lasting building material; therefore, brick masonry walls have been employed in building construction for thousands of years with minor changes.

Burnt clay bricks, sand-lime bricks (calcium silicate bricks), Concrete bricks, Fly ash clay bricks, and Firebrick were used in its construction. The bricks of the wall are joined together using masonry.

The brick wall thickness could be 20cm or 10cm. A 20cm wall is used for the exterior walls, and a 10cm wall is used for inner walls.



Rubble Stone Masonry Wall

More or less, huge stones are grouped to bond so that the stones and the regular arrangement of stones extend along with the thickness of the wall while constructing a rubble stone masonry Wall.

Course Rubble Stone Masonry Wall

Random Rubble Stone Masonry Wall

2. Non-Load Bearing Wall (Drop Wall)

these walls do not carry any load of the floor or roof above it. Partition walls are non load bearing walls as they are just built to divide rooms and have no structural integrity.

Types of Non-Load Bearing Walls
Followings are the type of non-load bearing walls based on the used wall unit:

- Hollow Concrete Block Wall

- Facade Bricks Wall
- Hollow Bricks Wall
- Brick Walls

Brief descriptions of these types of non-load bearing walls are given below:

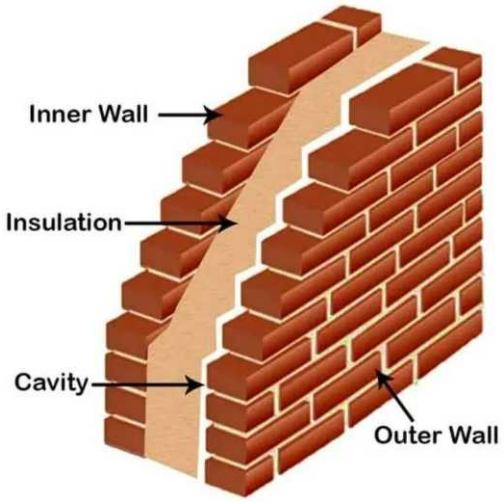
Hollow Concrete Block
The walls of the concrete building are made hollow. It has the advantage of great strength. It gives stability without any waste of material.

Facade Bricks
It is solid, durable and practically maintenance free. Colors do not lose their radiance in this brick. Facade bricks are ecological and sustainable.

Hollow Bricks
They are green living. They can reduce the use of heating and cooling devices. They are strong and better used. Hollow bricks are cost effective.

Brick Walls
It is an immovable block or wall made of brick. Brick walls are easy to install.

3. Cavity Walls
It is a wall constructed in 2 leaves / skins with a space / cavity between them. A type of building wall construction consisting of an outer wall fastened to inner wall separated by an air space. Cavity walls helps to prevent the penetration of rain to the internal surface of the wall.

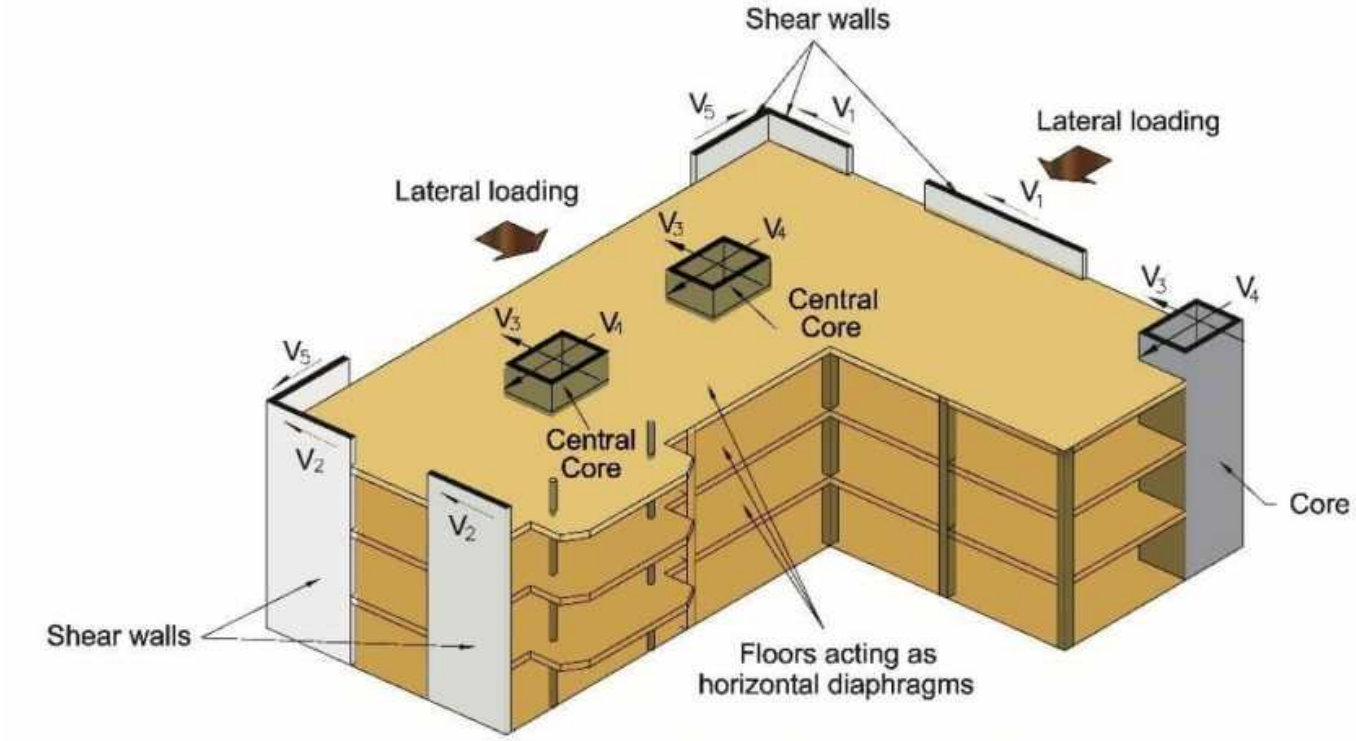


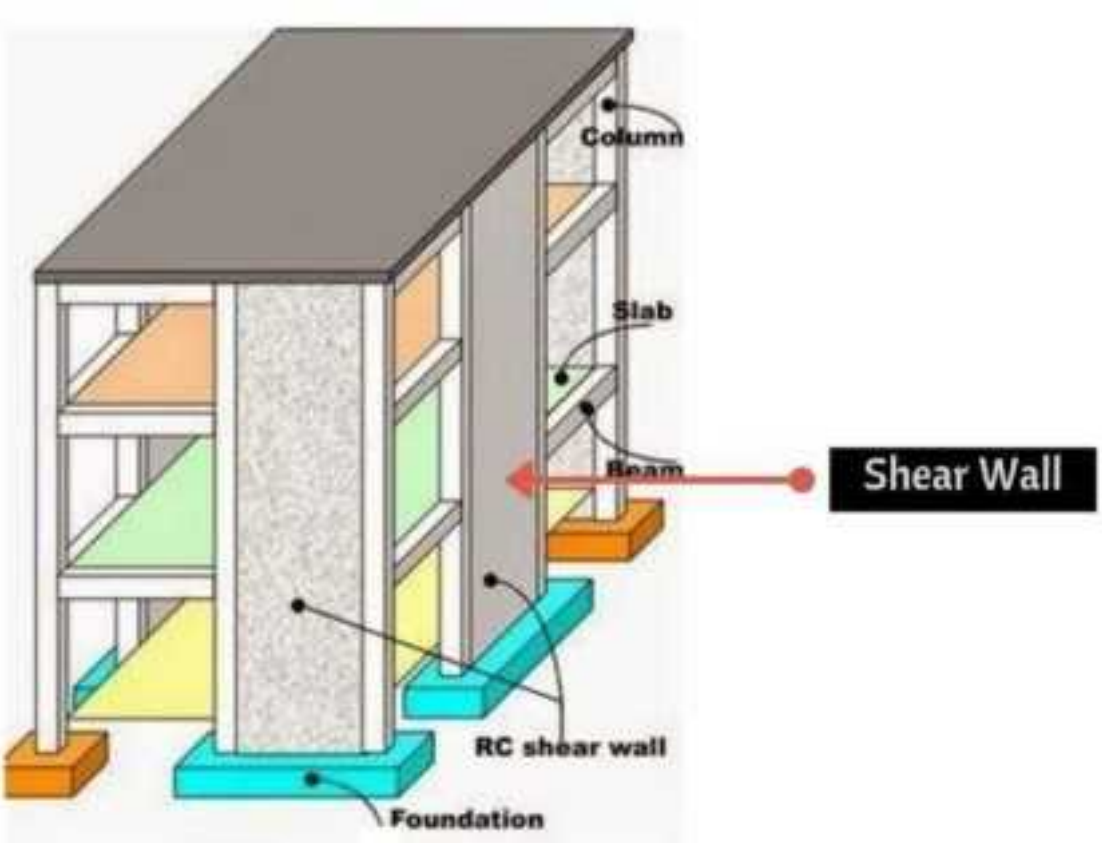
4. Shear Wall

Shear walls are a framed wall designed to resist lateral forces. It is a vertical elements of the horizontal force resisting system. .

Shear wall is a vertical element used to resist lateral forces such as wind and seismic forces acting on a building structure. It works as a vertical cantilever beam supported at the ground carrying vertical load together with columns. Shear walls are mainly used in high rise buildings.

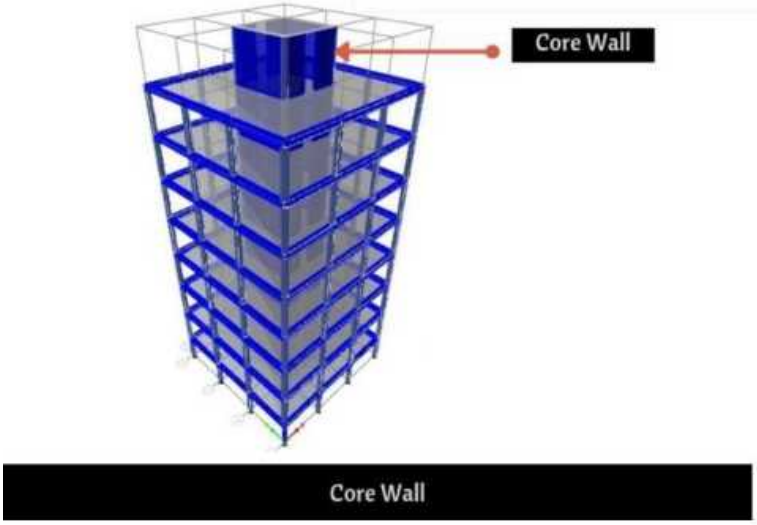
Shear walls construction and implementation are simple; it is symmetrically placed to minimize the negative twisting effects. There are no stability issues with the shear wall. It is used to resist wind and earthquake loading on a building





5. Core Wall

The construction of this wall begins at the building's foundation and rises to the same height as the structure. This wall serves as a shear wall as well as a column.



Core wall is constructed from the foundation and it raised upto the height of the building. In this type of wall, the wall itself acts as a column. Core wall is built to carry the lateral force exerted on the structure due to wind, earthquake or any other lateral load.

Core walls are a combination of shear walls. They are organized and arranged like a core and installed at the geometric centre of the building to void the torsion effect.

6. Parapet wall:

The wall which is constructed on the top floor of the building to prevent the falling in anything from the roof. The height of the parapet wall is 3ft.

7. Curtain wall:

The wall which is constructed with glass, aluminium or with a steel frame is called a Curtain wall. This type of walls is generally adopted in offices, Hospitals and other public buildings.

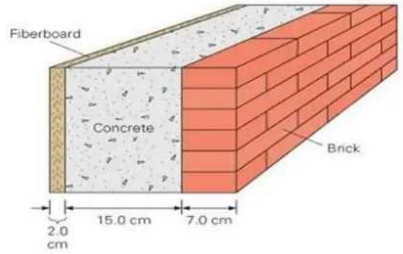
8. Boundary Wall or Compound wall:

The wall which is constructed all around the building to show the limits of the plot is called a boundary wall.


Boundary wall or Compound wall

9. Faced Wall

It is a wall in which the masonry facing and backing of two different materials are bonded together so that they perform the same function under stress. It gives the impression of being more streamlined, and the fronted wall is simple to erect.



FLOORS

What Is Flooring?

The purpose of flooring is to get a good hard, level, and beautiful surface for living. The floors directly resting on the ground are known as ground floors while the floors of every storey are called upper floors. Apart from giving a good finished surface, these floors should have good damp resistance.

The ground surface is rammed well, along with a layer of red earth or sand is placed, which can be compacted. A layer of broken bricks, stones, etc. are provided up to 150 mm below the floor finish level and rammed. While ramming, the surface is kept moist to get good compaction.

Then 1: 4: 8 concrete of 100 to 150 mm thickness is provided as base course. Over this bed, the floor finish is laid.

Types of Flooring.

Different types of flooring are as follows.

- Mud and Moorum Flooring.
- Brick Flooring.
- Flag-Stone Flooring.
- Cement-Concrete Flooring.
- Terrazo Flooring.
- Mosaic Flooring.
- Marble Flooring.
- Tiles Flooring.
- Timber Flooring.
- Rubber Flooring.
- P.V.C. Flooring.

1. Mud and Moorum Flooring

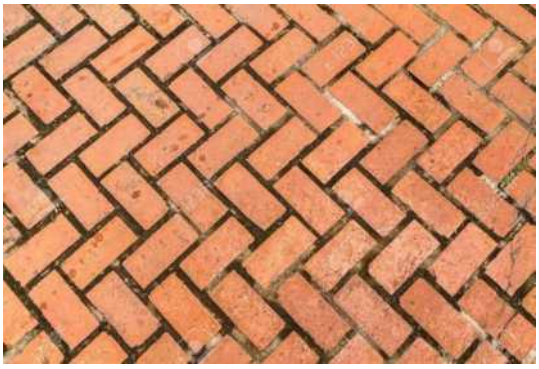
These floorings are used in the low-cost home, specially in villages. On the hard coating of earth, filling mud or moorum layer is provided. The floor requires a thin wash of cow dung at least once a weak

2. Cement-Concrete Flooring

It's a modestly cheap and durable floor and therefore, commonly used in residential, commercial, and industrial buildings. It consists of two courses-base courses and wearing a coat. The base course is laid within well-compacted soil.

Its thickness is usually 75 mm to 100 mm. After base coarse is hardened, wearing a coat of 40 mm is laid. It consists of panels of 1 m × 1 m, 2 m × 2 m, or 1 m × 2 m. It needs curing for 7 to 14 days. To get a good appearance many times, a red-oxide finishing coat is provided.

3. Brick Flooring



This is also a cheap floor construction. It's commonly utilized in godowns and factories. Bricks are laid flat or on edges. Bricks of very good quality ought to be used for the construction. Brick-layer is provided on a sand bed or onto lean concrete (1: 8: 16) bed. In both cases, joints have been rendered flush and finished with cement mortar

4. Timber Flooring

- 

Timber flooring is used in dancing halls and in auditoriums. Timber plates might be directly placed on a concrete bed or might be provided over timber frame-work. This flooring is costly.

4. Flag-Stone Flooring

Laminated sand-stones or slates of 20 mm to 40 mm thick slabs of 300 mm × 300 mm or 450 mm × 450 mm or in the kind of rectangles of size 450 mm × 600 mm are used as floor finishes. The stone slabs have been laid on 20 to 25 mm thick mortar spread over a concrete bed. The joints must be finished with rich mortar.

6. Terrazo Flooring

Terrazo finishing coat is applied over concrete flooring to get a pleasing appearance. Terrazo finish consists of 75 to 80 percent of surface marble chips embedded in cement mortar. Marble chips are mixed in cement at the ratio 1: 1.25 to 1: 2, and about 6 mm terrazo toppings are laid. The top is tamped and rolled. Additional marble chips have been spread during tamping to get a proper distribution of marble chips onto the surface. After drying it for 12 to 20 hours, it's cured for 2–3 days.

7. Mosaic Flooring

It is made up of a finishing coat of small pieces of broken tiles of China glazed or of marble arranged in different patterns set in lime-surkhi or cement mortar. The base coarse is concrete flooring, and onto it, 30 to 40 mm mortar layer is provided.
With this particular mortar layer, broken pieces of china, glazed or marble, are set to get different attractive patterns. Following 20 to 24 hours of drying, the top is rubbed with a carborundum stone to get a smooth and polished surface

8. Marble Flooring

Marble slabs are cut to get marble tiles of 20 to 25 mm thickness. They're laid on floors similar to other tiles. Using a power-driven machine, the surface is polished to get shining and even surface. This type of flooring is commonly used in temples and hospitals.

9. Tiles Flooring

This is an alternative to terrazo flooring, used commonly used in residential, office, and commercial buildings. Tiles of clay, cement, or terrazo of standard sizes are manufactured in factories under controlled conditions.
On the concrete base, 25 mm to 30 mm thick mortar is laid, and these tiles have been placed and pressed using a trowel or wooden mallet. Before placing tiles, care is taken to see that the neat cement slurry is applied to the bottom side and sides of tiles to get a good bond.

10. Rubber Flooring

Tiles or sheets of rubber with fillers like cotton fibers, asbestos fiber, or granulated cork are manufactured in a variety of patterns and colours. These tiles or sheets might be fixed to concrete or timber floors. These floors are attractive and noise proof. But they are costly.

11. P.V.C. Flooring

Poly-Vinyl-Chloride (PVC) is a plastic that's available in different colour and shade. These days, tiles of this material are used widely. Adhesives are applied on a concrete base as well as on the bottom of PVC tiles. Then the tile is pressed gently with a 5 kg wooden roller till the oozing of adhesive is seen.

The oozed out adhesive is wiped, and the floor is washed with warm soap water. The floor finish is smooth, attractive, and can be easily cleaned. But it's slippery and costly

ROOFS(FLAT, SLOPED, VAULTED)

ROOF

A roof is the highest component of a building that serves as a structural covering to protect the structure from the elements (i,e from rain, sun, wind, etc). Roofs are built in the same way as upper floors in terms of structure, albeit the shape of their upper

surfaces may differ. Roofs have been built in a range of shapes and sizes, including flat, pitched, vaulted, domed, and combinations, depending on technical, economic, and aesthetic concerns.
A roof is made up of a structural element that holds the roof covering in place. Trusses, portal beams, slabs (with or without beams), shells, and domes are examples of structural elements. A.C. sheets, G.I. sheets, hardwood shingles, tiles, slates, or the slab itself can all be used as roof coverings.
Rain and snow fall more directly and in greater quantities on the roof and roof covering than on the walls. As a result, it must provide a significant barrier to rain ingress, with strong weatherproofing being especially critical. Simultaneously, the roof framework that supports the roof covering must be sufficiently strong and stable. A roof must also have thermal insulation, fire resistance, and sound insulation in addition to these features.

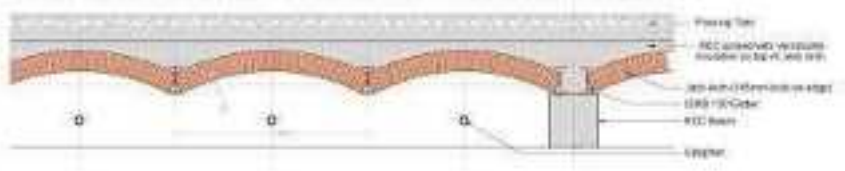
Types of Roofs:

The shape or plan of a building, the climatic conditions of a location, and the type of construction materials available all influence the type of roof chosen. Roofs can be divided into three main types:

- Flat or terraced roof:
- Sloping or pitched roof:
- Curved roof:

Flat or terraced roof:

This type of roof has a slope of less than 10 degrees and is either horizontal or nearly horizontal. Even a completely horizontal roof must have a slight incline at the top to allow rainfall to drain quickly. The flat roof can be built using, reinforced cement concrete, reinforced brickwork, jack arch roof, in the same way as the upper level. The flat roof, on the other hand, differs from the upper floor mainly in terms of the top finish, which is known as terracing, which protects it from rain, snow, heat, and other elements.



1.

The RCC type of roofs is very common these days. Their durability and strength are unbeatable. In a building of hundreds of floors, the use of the RCC roof is adopted. Flat roofs are easy to construct, and no special skill is needed to construct a flat roof. Flat roofs are very common in regions where there is no snowfall. As the rainwater accumulates on the surface of flat roofs, these roofs are sloped a little and the rainwater is drained out.

RCC roof:

As the name indicates, a roof made up of pre-stressed concrete. A web of steel rods is first installed on the roof with the help of shutters. The steel web structure

is then covered with concrete. The durability of this type of roofs is greater, the steel structure is buried inside the concrete material, thus preventing it from rusting and oxidation. RCC roofing is common in buildings

2. Sloping or pitched roof:

A pitched roof is defined as a roof having a slanting surface. The following are the several types of pitched roofs:

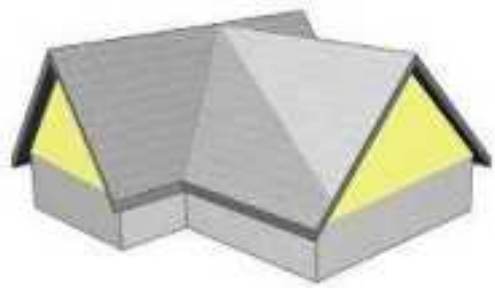
a) Lean-to-roof:

This is the most basic style of the sloping roof, which can be used for a small room or a verandah. Only one side of this has a slope.

b) Gable Roof:

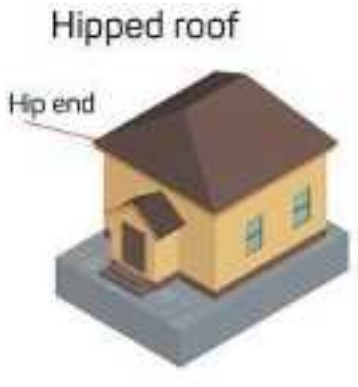
The triangle produced when the two pitched portions of the roof meet are referred to as a gable.

The gable roof is a particularly common style of the roof because it is simple to construct, sheds water well, allows for ventilation, and can be used with almost any building design.



c) Hip Roof:

A conventional hip roof is made up of four slopes of equal length that meet at the ridge to make a simple ridge.



d) Gambrel Roof:

It's also known as barn roof because e it's commonly seen on barns. It adds to the attic's headroom. A gambrel roof is a symmetrical two-sided roof with a shallow upper portion and steeper lower slope on either side, most typically found in barns. This design maximizes the space within a building's loft, but it's generally utilized on outhouses and barns because it's ineffective in locations with high winds or snowfall.

(3). Curved Roofs:

The third type of roof is the curved roof. A curved roof is a roof that has a curved style. Both the pitched and the curved roofs are aimed at the same. Only the style and design are different.. These types of roofs give more attraction and charm to the building. The purpose of these roofs is to shed the snow and rainwater. But modern architecture is evolving these roofs into multi-curved roofs. Keeping in view different designs of the curves, these roofs are classified into three groups:

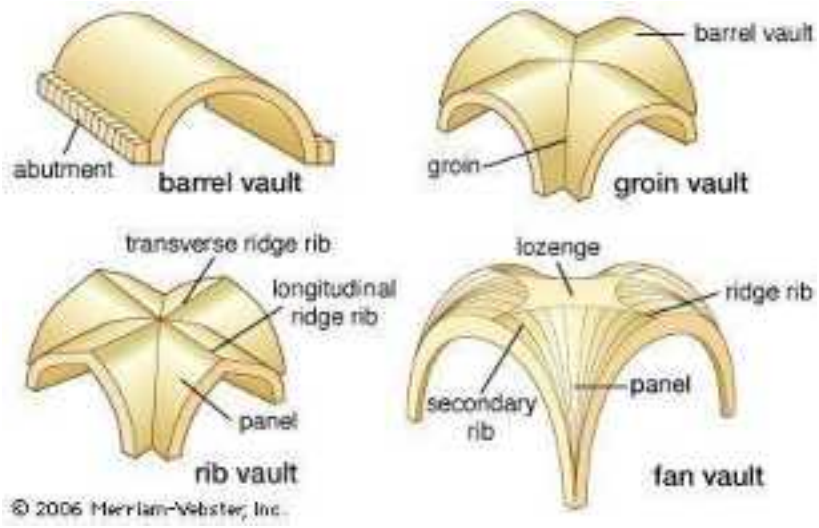
1,Barrel Vaulted Roof:

2. S-Shaped Panels:
3. Elliptical and Freeform Curved Panels:

Barrel Vaulted Roof:

As the most prevalent type of curved roof, a convexly curved roof is also known. It has a symmetrically rounded appearance because of its continuous curvature.

The barrel vault is the simplest form of a vault: effectively a series of arches placed side by side (i.e., one after another). It is a form of barrel roof.



4. S-Shaped Panels:

In the shape of an “S,” roof panels can be found that combine a combination of convex and concave curves. This type of panel is commonly employed by architects who are looking to push the boundaries of traditional design.

5. Elliptical and Freeform Curved Panels:

Roof panels can be produced in practically any curved shape and angle to bring an architect’s vision to life in a unique roof design. Soft, severe, or a combination of curves can all be used to create the illusion of waves with these curved panels.

Advantages of Curved Roof

- It can be constructed in short time.
- Cheap in construction.
- Requires less frame work.

- The construction of these roof is simple in technique and it is and much similar to standard flat roof and moreover it is wind resistant. These qualities make it low maintenance roof.
- The curved roof is generally designed by architect, hence they are well planned according to the location of construction.

ROOF COVERING

Introduction of Roof Covering Material

A roof may be defined as the upmost part of the structure. A roof is a top covering of a structure, including all accoutrements and constructions necessary to support it on the walls of the structure or on uprights, furnishing protection against rain, snow, sun, axes of temperature, and wind. A roof is part of the structure envelope.
Principally, a roof consists of structural rudiments that support the roof covering. Roof and roof covering admit rain and snow more directly and in a lesser volume than do the walls. A roof must have thermal sequestration, fire resistance and sound sequestration.
The roof covering must have acceptable strength and stability.

It's strictly fixed to the roofing structure with colourful types of fittings and institutions—the colourful types of roof covering accoutrements available in requests in different sizes and shapes

Different Types of Roof Covering

The roof requires a cover to protect the house from adverse goods of the environment. There are several different types of roofs with pictures materials.

- **Thatch**
- **Tiles**
- **Solar shingles**
- **Wood shingles**
- **Asbestos cement sheet**
- **Galvanized corrugated iron sheet**
- **Lightweight roofing**

Thatch covering

This form of covering is extensively used in sheds, low-cost houses and village buildings. It is considered suitable for rural areas because it forms the cheapest and the lightest material as a roof covering.
Sometimes fire-resisting properties are imparted to the thatch by soaking it in specially prepared fire-resisting solutions that are very costly. For adequate drainage of rainwater, the thatch covering should be at least 15 cm thick and laid with a slope of 45°.

Shingles

The use of wood shingles as a roof covering is generally restricted to hilly areas where wood is easily and cheaply available in abundance. Wood shingles are

nothing but the sawn or split thin pieces of wood resembling slates or tiles. These sawn shingles, which are obtained from well-seasoned timber, are dipped in creosote to impart preservative qualities. Shingle strips are driven on rafters and shingles are nailed on their top. Shingles are commonly obtained in length varying from 30 to 50 cm and in width varying from 5 to 25 cm.

Tiles

The use of tiles is one of the oldest methods of roof covering. The tiles are named according to their shape and pattern and they are manufactured in a similar manner as bricks. The clay tiles are of various types such as flat tiles, pantiles, pot tiles or half-round country tiles and patent tiles such as Mangalore and Allahabad tiles. Sometimes cement concrete tiles are also used but are limited on account of high cost and the difficulties in their manufacture. Clay tiles have been widely used as a roof covering material for residential buildings.

Asbestos cement sheets

Asbestos cement is a material that consists of Portland cement and asbestos fibres (about 15 per cent). Roof covering made of this material is cheap, tough, durable, watertight, fire resisting and light in weight. Asbestos does not require any protective coat. Asbestos cement roof coverings are supplied in flat corrugated and ribbed sheets in various sizes.

Corrugated GI sheets

These are used for the roof coverings of workshops, factories and temporary sheds. GI sheets are available in various sizes. Generally, 22 gauge sheets are used. End lap of 15 cm and side lap of two corrugations are provided at the time of fixing the GI sheets at the top of the roof. It is light and simple to fix. The only disadvantage with the use of these sheets for roof covering is that during the summer season, the rooms under the roof are heated too much. To protect against the sun, sometimes a layer of ordinary tiles are provided at the top of GI sheeting.

CEILINGS,

ceiling, the overhead surface or surfaces covering a room, and the underside of a floor or a roof. Ceilings are often used to hide floor and roof construction. They have been favourite places for decoration from the earliest times: either by painting the flat surface, by emphasizing the structural members of roof or floor, or by treating it as a field for an overall pattern of relief.

Different types of ceilings | Styles and Materials
When deciding on the different types of ceilings there are styles (drop ceiling, surface mount) and materials (mineral fiber, fiberglass, wood, metal) to consider. Each style and material have their own advantages and benefits.

Different types of ceilings
Drop ceiling
installation methods and styles
Drop ceiling
This installation method is most commonly used in commercial businesses, medical facilities, and home basements. Drop ceilings allow easy access to pipes, ducts, and wiring and require less clean-up after installation.
Drop ceilings can look very different, depending on the style Some of the different looks are:

Surface mount ceilings
These are also known as “Direct Apply” ceilings. This method maximizes overhead space, helps cover up imperfections in drywall or old popcorn ceilings, and can provide an alternative to an all white ceiling.

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Popcorn Ceilings

Popcorn ceilings (also called acoustic or stipple ceilings) are a type of textured ceiling style that, depending on the ceiling color (typically white, cream, or softer hues) resembles kernels of popcorn. Started sometime between the 1920s and 1930s, the original purpose was to create a barrier for sound (hence the acoustic-sounding name). The texture comes from layers of paint—spray on, sponge on, or paint-on—that create a varied, thicker look.

Exposed ceiling
This style of ceiling leaves the structural and mechanical systems exposed, creating an industrial aesthetic. Because of all of the open space and hard surfaces, though, noise problems will arise.

Ceiling Materials

Mineral Fiber Ceiling

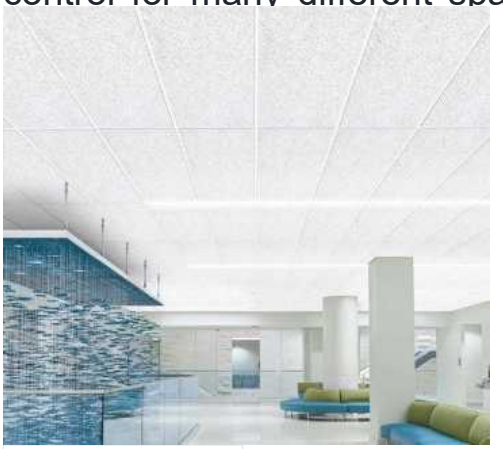
This material offers acoustic benefits, reducing noise by up to 95%, and has superior mold and sag resistance in some tiles.

Fiberglass Ceiling

These tiles are lightweight, easy-to-clean and install, and offer a variety of noise reduction and moisture resistant properties.

TECTUM Wood Fiber Ceiling

TECTUM ceiling panels are highly sustainable and durable, providing noise control for many different spaces like pools and gyms.



Metal Ceiling

Get the combination of performance (washable, scrubbable, impact- and soil-resistant) and looks (smooth and sleek design) with metal ceiling panels.

Wood-look MDF Ceiling

For residential use only, wood-look ceiling planks are a stylish and super popular product for homes and some finishes can even be used on walls.

Which ceiling type is best?
The best ceiling type depends on a lot of different aspects of the space. There are different performance attributes that a ceiling might need, different textures that are important to a room, or a multitude of different elements.
What is the most common ceiling?

Historically, the most common ceiling type has been popcorn ceilings because of their price, the low maintenance, and the ease of installation. In recent years, growing more and more popular are wood look ceilings, decorative ceilings, and drop ceilings

STAIRCASES (PRINCIPLES AND DIFFERENT GEOMETRIC TYPES),

what are the stairs?

A series of steps. to connect the two floors of the building is called stairs. and the room in which the stair is made is called the staircase.

A series of steps is called a flight. the length of the flight is 3 to 15 steps. if the number of steps is more than 15, two flights are made and a horizontal surface to stay between the two flights is called landing. so as not to get tired while climbing the stair.

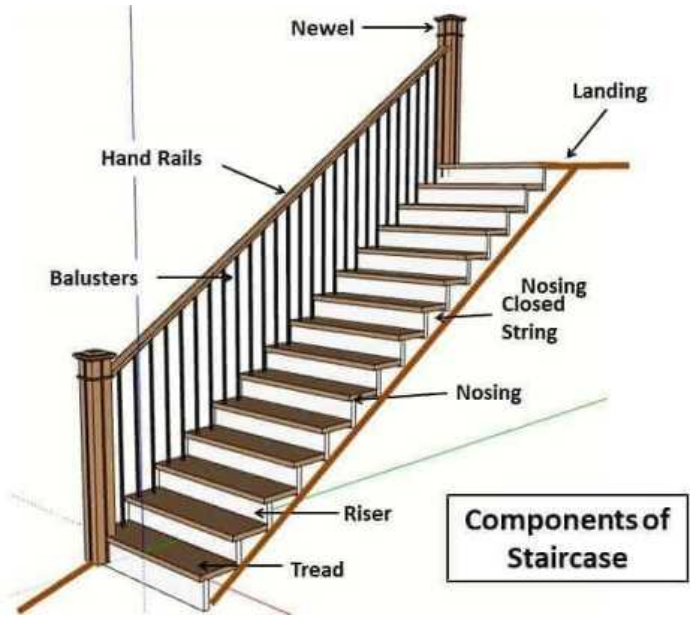
the horizontal distance of each step is called going. while the surface is called tread. and the vertical surface of the step is called Riser. the minimum size of tread is 10 to 12incehs and the minimum size of the riser is 6 to 9incehs.

The shape of normal steps is rectangular this is called the flier step. sometimes steps are also made at the middle of the landing site that one is triangular is called winder.

Sr. No.	Components of Staircase	Characteristics
1	Stairway	Space in which staircase is provided
2	Step	The structural and functional unit of a staircase Consecutive riser and tread forms a step
3	Curtail step	The first step of a staircase Its width is more than that of other steps in the staircase
4	Flight	A series of steps without any landing 8-10 steps from a flight generally
5	Tread	The horizontal component of a staircase on which foot is placed while ascending/descending the staircase Minimum width: 270 mm (for residential buildings) and 300 mm (for public buildings)
6	Riser	The vertical component of a staircase on which a tread rests Rise: Distance between two consecutive treads minimum value190 mm (for residential building)150 mm (for public buildings)
7	Nosing	Overhang portion of a tread beyond the riser on which it is resting
8	Scotia	Additional block provided underneath the nosing
9	Blocking	Additional block provided underneath the step
10	Winder	A type of step whose width reduces from one to the other end Can be provided in place of landingUsed for the steps of a spiral staircase
11	Landing	A horizontal platform between two consecutive flights of stairs Allows a person to rest also provided when the direction of flight changes
12	Going	The horizontal distance between two consecutive risers
13	Pitch	Vertical angle between the line of nosing with horizontal
14	Line of nosing	The imaginary line joining the nosing in a flight
15	Run	The total horizontal length of all flights including landing
16	Handrail	Inclined rail parallel to the slope of the stair mounted on vertical posts at the end Provides support to the user during ascent/descent and also prevents accidental fall

17	Base rail	Inclined rail parallel to the handrail at the bottom of the baluster Provided when the baluster is not embedded into the floor also called shoe rail
18	baluster	Vertical member supporting a handrail throughout the run Prevents accidental fall
19	Balustrade	The framework of balusters and handrail
20	Newel post	Structural member at the start and end of the flight anchoring the handrail Embedded into the floor and bolted to the floor joist
21	Newel cap	Enlarged top of newel post for sound grip
22	Soffit	The underside of the staircase The bottom of the stair slab
23	Waist	The thickness of the RCC slab on which the staircase rests
24	Stringer	A structural member which accommodates the steps on either side
25	Headroom	Vertical clear distance between the floor on which staircase ends and ceiling Minimum value: 2 m

Parts of a Stair with Characteristics



1. Step:

It is a combination of tread and riser which permits ascent and descent from one floor to another.

2. Tread:

The upper horizontal portion of the step over which foot is placed during ascending or descending a stairway is known as tread.

3. Riser:

The vertical member of the step is known as riser. It is used to support and connect successive treads.

4. Rise:

The vertical height between two consecutive treads is known as rise.

5. landing:

A horizontal platform between two successive flight of a stair is called landing. Landing is used as a resting place during use of the stair. It facilitates the change of direction of the flight.

Landing which extends for full width of the staircase is known as half-space landing. Landing extending for only half the width of staircase is known as quarter space landing.

6. Nosing:

It is the projecting part of the tread beyond the face of the riser. Nosing is usually rounded to give good aesthetic effect to the treads and make staircase convenient and easy to use.

7. Going:

The horizontal distance between without the faces of two consecutive risers is known as going of steps.

8. Flight:

A continuous series of steps without any break between landings or landing and flooring is known as flight.

9. Head Room:

The vertical height between the tread of one flight and the ceiling of the overhead construction is known as head room. Head room should be sufficient so as not to cause any difficulty to the persons using the stair. Head room is also known as head way.

10. Hand rail:

It is an inclined rail provided at convenient height over balustrades. The inclination of the rail is parallel to the slope of the stair.

It serves as a guard rail and provides assistance to the users of the stair. hand rails can be molded in so many architectural forms. It also acts as a protective bar.

11. Baluster:

It is an individual vertical member made of timber, metal, or masonry and fixed between string and hand rail to provide support to the hand rail.

12. Balustrade:

Framework made from series of balusters and hand rail is known as balustrade. It is also known as barrister.

13. Pitch or Slope:

The vertical angle made by nosing line of the stair with the horizontal is known as pitch or slope of the stair.

14. Run:

The total length of the stair in horizontal plane including lengths of landings is known as run of the stair.

15. Soffit:

The undersurface of the stair is known as soffit. It is either finished with plaster or covered with a ceiling.

16. Scotia:

It is a sort of additional moulding provided under the nosing or tread to beautify the step of elevation.

17. Newel-post:

It is a vertical timber or steel post provided at the head, foot, or at point where the balustrade changes its direction. It is also used for supporting the hand rail.

18. Strings Or Stringers:

These are the sloping wooden members of a stair, used to support the end of the steps. Stringers may be two types, Cut or open type and closed or housed type.

In case of former type, the upper edge is cut exactly to size to receive the ends of steps. In latter type i.e closed or housed type, the ends of steps are housed into the stringers.

19. Waist:

The thickness of the RCC slab over which steps of RCC rest, is known as waist.

20. Line Of nosing:

It is an imaginary sloping line parallel to the slope of the stair and touching the nosing of all the treads.

21. Walking Line:

It is the approximate line on the stair, adopted by the people during the use of the stair. This line is located about 40 cm from the centre of the handrail.

22. Spandrel:

It is triangular framing under the outside string of an open string stair.

23.Winder

Winder is a type of step that is narrower at one end. It is provided to avoid allotting a landing while changing the direction of the flight.

By employing a series of winders, a spiral staircase is constructed.

Requirements of Good Stair

A good stair has some requirements

stair should be in the middle of the building.

All steps of the stair should be the same shape and size.

The slope of the stair should be from 25 degrees to 40 degrees.

The width of the stair should be such that two persons can easily go and come from downside to upside at the same time and the width for this purpose is a minimum of 3ft.

The height of the headroom is a minimum of 25 meters.

The height of the handrail from steps should be 75cm to 85cm.

The number of steps is not more than 15 and not less than 3meter.

The materials used in the stair is strong and durable.

There should be a proper arrangement of air and light.

Principle of Designing of Stair

When designing any leader it should be kept in mind that the design should be so simple that the users should not face any problem but should be comfortable as possible. some principles of designing stairs,

1 Ratio Between Tread and Rise

2 Slope of Stair

The slope of stairs is minimum 25to 40degrees

3 Width of Stair

The width of stairs is minimum such that the persons can easily be going and come pas for this purpose is width 75cm. more people use for more width.

4 Length of Flight

The length of the flight of stairs should not be too long as to climb a long time. The number of flights is more than 15 and not less than 3.

5 Width of landing

In no case should the width of the landing be less than the width of the stair In some cases, the width of the landing is kept slightly higher than the width of the stair.

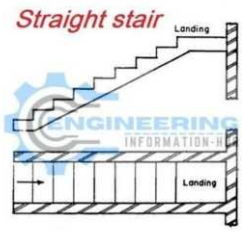
6 Hand-rail and baluster

It is very important to have fences and handles for the convenience and safety of the users. For this purpose, the height from step to hand should be 5cm.

Types of Staircase Depending on the Shape:

1. Straight Flight Staircase

This is essentially a single stretch of stairs that runs from one floor to another. It is the cheapest to construct and is the most common type of staircase used for dwellings.



This type of staircase usually leaves a lot of space underneath it that , that may be used in a variety of ways – a cupboard under the stairs for example, or maybe a small water closet.

Advantages of Straight Staircase:

- **Cheaper**

– The straight flight staircase is much simpler to construct than the other staircases due to simpler construction methods.

- **Simplicity**

– The simplicity of a straight flight staircase can be very attractive. One can feel free to experiment with materials, treads, risers and balustrades to create a simple yet elegant design.

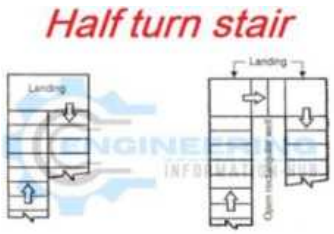
- **Visibility**

– Straight flight staircase allows an uninterrupted view of the other end of the staircase. This makes the staircase slightly safer with no visual obstructions.

- **Ease Of Construction**
  – This is without doubt, the easiest staircase to construct with simple and fast construction methods.
-

2. Dog Legged Staircase

This type of staircase consists of two flights, parallel to each other. The flights of stairs run in opposite directions and have little or no space between their balustrades. Sometimes, the two flights of stairs may be on adjacent walls, then forming a quarter-turn staircase.



Advantages of Dog Legged Staircase

- **Efficient Use Of Space**

– This type of staircases cover much less floor area than straight fight stairs. They allow a more compact staircase arrangement.

- **Privacy**
  – These staircases are great in case you want to separate one floor from another for any reason. As one cannot see the upper floor from the lower floor and vice versa, these staircases provide ample privacy to the users.

3. Open Well Staircase

The open well staircase gets its name from the space or well that is present in between the balustrades of the staircase. It may have two or more flight of stairs. In cases in which there is two flights (then called a U-shaped stair) to cover a level, the open well staircase looks similar to the dog – leg staircase where the main difference lies in the gap present between the balustrades.

advantages of Open-Well Staircase

- **Grandeur**

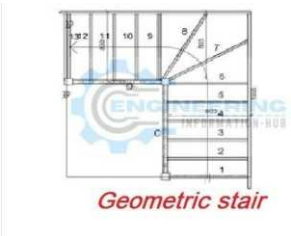
– With its extravagant use of space, the open well staircase, if designed properly, can be used as a statement of grandeur in home.

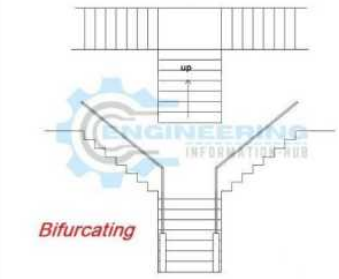
- **Visual Connectivity**

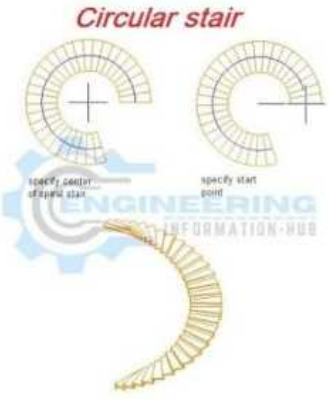
  – The open-well staircase provides visual connectivity all the way from the top most level to the bottom level, regardless of the number of floors it covers.

4. Geometrical Staircase (Spiral, Elliptical or Open-Well Circular)

Geometrical staircase refer to the staircases having treads that taper in their plan. They maybe helical (spiral staircases), open well circular staircases, or even elliptical staircases.







Advantages of Geometrical Staircase design

- **Creation Of Space**

– These staircases do not occupy as much space as normal staircases. The more gradual the climb, the more space it will occupy, but the space utilised is much less than say a straight flight staircase or maybe a open-well staircase.

- **Aesthetic Appeal**

  – These staircases add a sculptural appeal to the space that their occupying. Properly implemented, these staircases add can become the focus of a space.

Disadvantages of geometrical Staircase Design

- **Difficult To Climb**

– If you”re hoping for a comfortable climb, then these staircases are best avoided. The continuous change of direction and tapering treads are not the easiest to manoeuvre.

- **Expensive**

– The unique and complex design of spiral staircases can result in a costly build as well as making them quite expensive to maintain afterwards. Steer clear of these staircases if you”re on a tight budget.

- **Difficult To Construct**

– Thanks to their geometrical designs, the construction of these staircases can be quite painstaking and prone to mistakes.

Staircases can be an amazing design feature in a house, as well as one of the most frequently used parts. So, remember to give ample time and thought to your staircase design.

DOORS

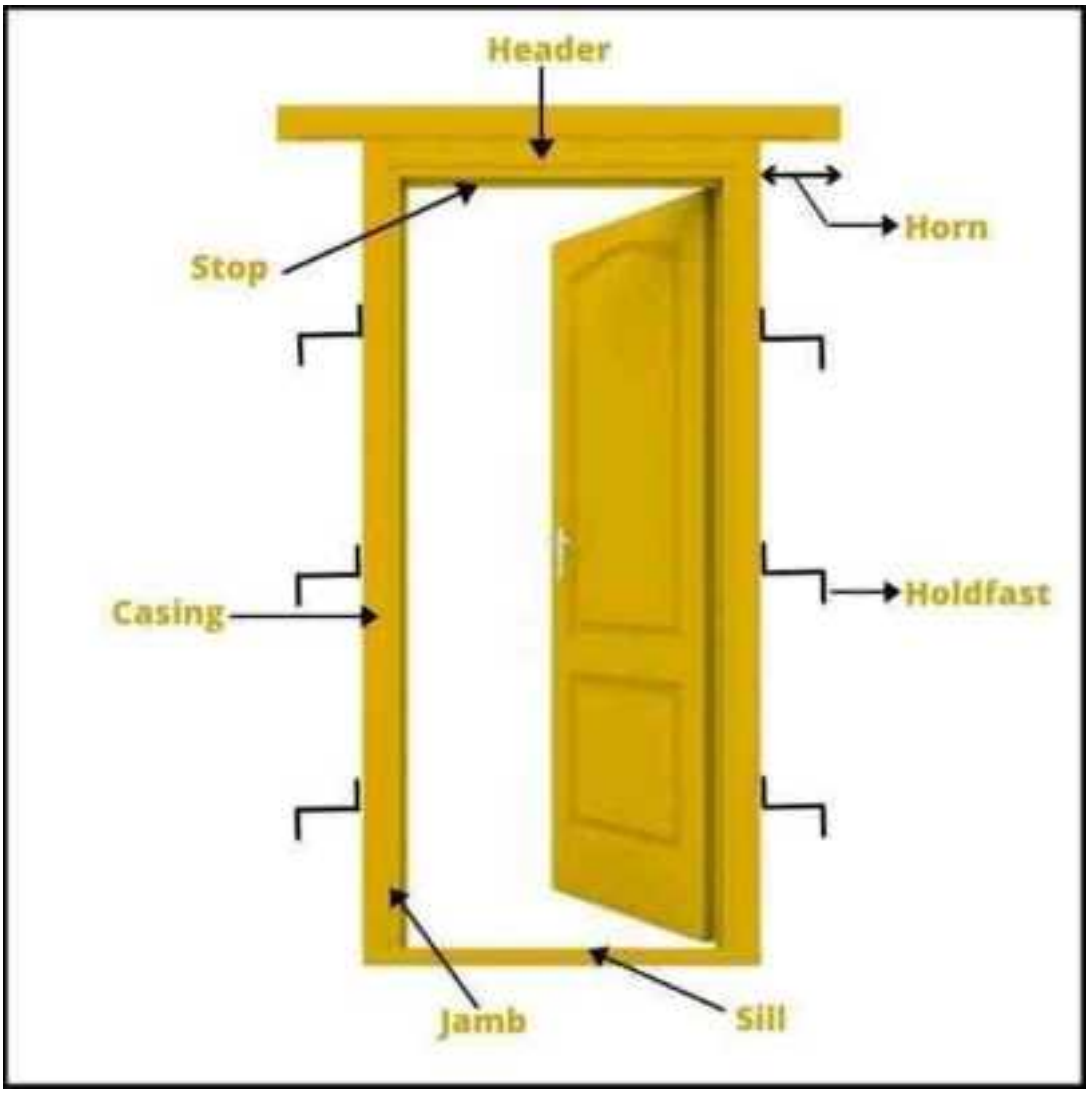
What is a Door?

The *door* is a moving mechanism which is more like a barrier made of wood, stone, metal, glass, paper, leaves, hides, or a combination of materials. A door understands the importance of having options when it comes to choosing the right fit for the architecture of our home and interior and exterior decor from the curb

through the foyer. Trendy to timeless, understated to elaborate, the door provides a warm welcome. There is a sharp contrast between interior and exterior door. A door has an aesthetic purpose in creating an impression of what lies beyond.

Parts of a Door Frame

The following are important Door Frame Parts



7 Parts of a Door With Their Functions

1. Sill

It is the bottom part of the frame which is sealed or fastened to the floor. During or after construction, it helps to prevent the bending of vertical members of the frame.

It has so many advantages like it prevents the entry of insects and dust. But it has a disadvantage also it creates an obstruction for moving and cleaning.

2. Door Jambs

It is the vertical member of the frame which supports the door opening. Side jambs are attached to the wall face which helps to door lock or open.

3. Head Jambs

It is the member that runs horizontally and is situated at the top of the frame,

4. Horn

The horn is the projection of horizontal members of the frame at the bottom and top. The main advantage of the horn is that it fixes the frame in a wall opening.

5. Threshold

It is a piece of wood that is used for exterior openings, and for filling the gap between the bottoms of the door and the floor. It also helps to drain off water from outside so that doors can open and close easily.

6. Sidelight

Sidelights are nothing but narrow vertical windows which are placed on one or both sides of doors. It helps to create lighten up a drab entry space.

It helps to improve the look of the door and the home's air quality. It also creates a stronger connection with the outdoors.

7. Transom

It is a horizontal crossbar that is situated over the doorframe, or between the window and door. The transom is used to allow a way to air and light even when the door is closed.

Types of Doors

There are many kinds of doors with different purposes. Doors are largely defined by the materials they are made from. Also, door classification varies due to the mechanism and usage. Followings are the classifications of doors:

1. Considering Material Used
    a. Wooden Door
    b. Metal Door
    c. UPVC Door

2. Considering the Mechanism & Usage
    a. Sliding Door
    b. Composite Door
    c. Swinging Door
    d. Revolving Door
    e. Folding Door

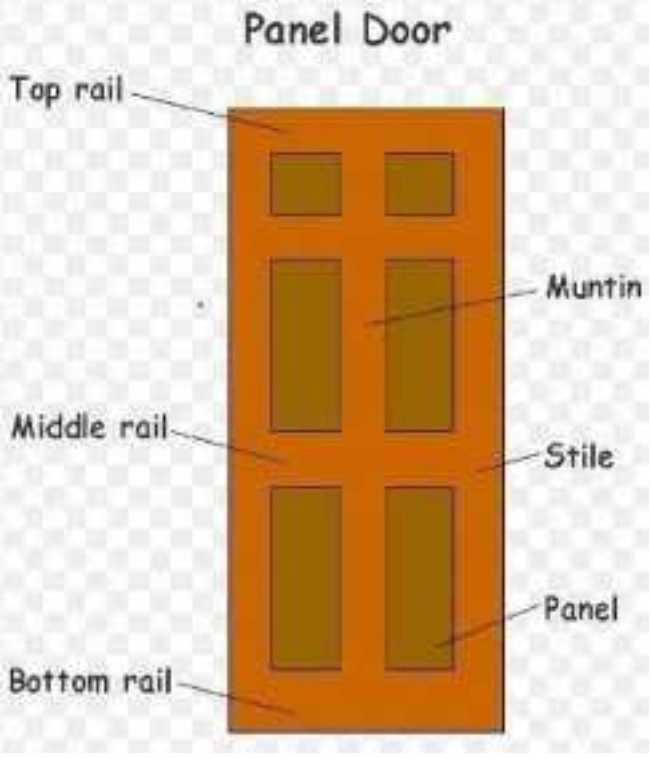
Types of Doors Based on the Material Used

Doors can be classified based on the materials used for making doors. The most used materials for the door are-

- Wood
- Metal
- UPVC

Wooden Door

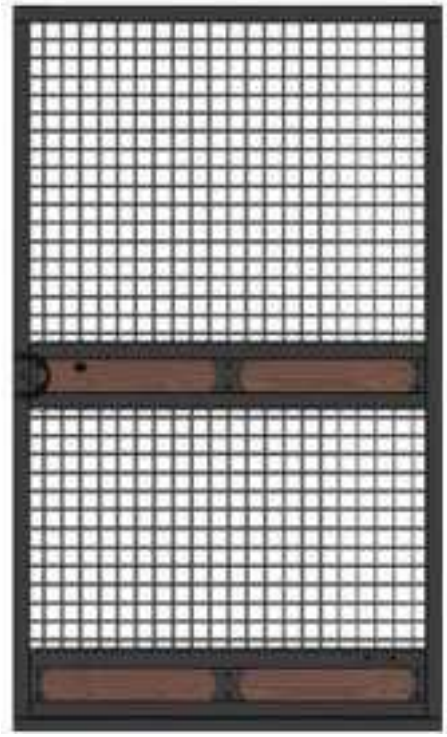
The wooden door is the top choice for the homeowners. It is a premium choice for your home interior and exterior with a rich sense of character and beauty on its own. Many antique doors were made of wood. A wooden door can be custom made which has decorative yet functional design options. Most of the wooden doors open in a swinging system; also, it is stained rather than painted because stain is a marketable choice allowing you to show the wood's natural grain.



Metal Door

As the name suggests, metal door is made of metal. It has a prolonged functional life with high dimensional accuracy and eminent corrosion resistance. It functions as a way to bolt the entrance to a formation and seal the components out. It's more like

a barricade type which can withstand storm and earthquake. A metal door can be made with glass kit, louver, fire, storefront.



UPVC Door

UPVC door is a replacement for a wooden door. It is made of a fully recyclable material, in keeping with our green living either like plastic, glass or bamboo. It has various types e.g. gold, solid or platinum. Double glazed UPVC door is in high demand nowadays. It is mainly used in the interior, bathroom, and garden.

Different Types of Doors Based on the Mechanism & Usage

Doors are of various kinds. Only a few are famous because of their mechanism and usage. They are-

- Sliding Door
- Composite Door
- Swinging Door
- Revolving Door
- Folding Door

Sliding Door

A sliding door is an elegant aesthetic to any home or places providing euphony. Sliding door opens crosswise by sliding which is parallel to the wall.It has a horizontal mechanism. Slide door is also known as"Patio Door".It is commonly used as shower door, glass door, screen door or in vans. It permits people to both enter and leaves. It is usually considered a single unit which consists two-panel sections. A sliding door is usually made of wood, aluminum, stainless steel but it appears in its best form when it is made from UPVC plastic glass. A sliding door offers different

design possibilities. We can see the usage of sliding doors in the airport terminal or in a hotel room.

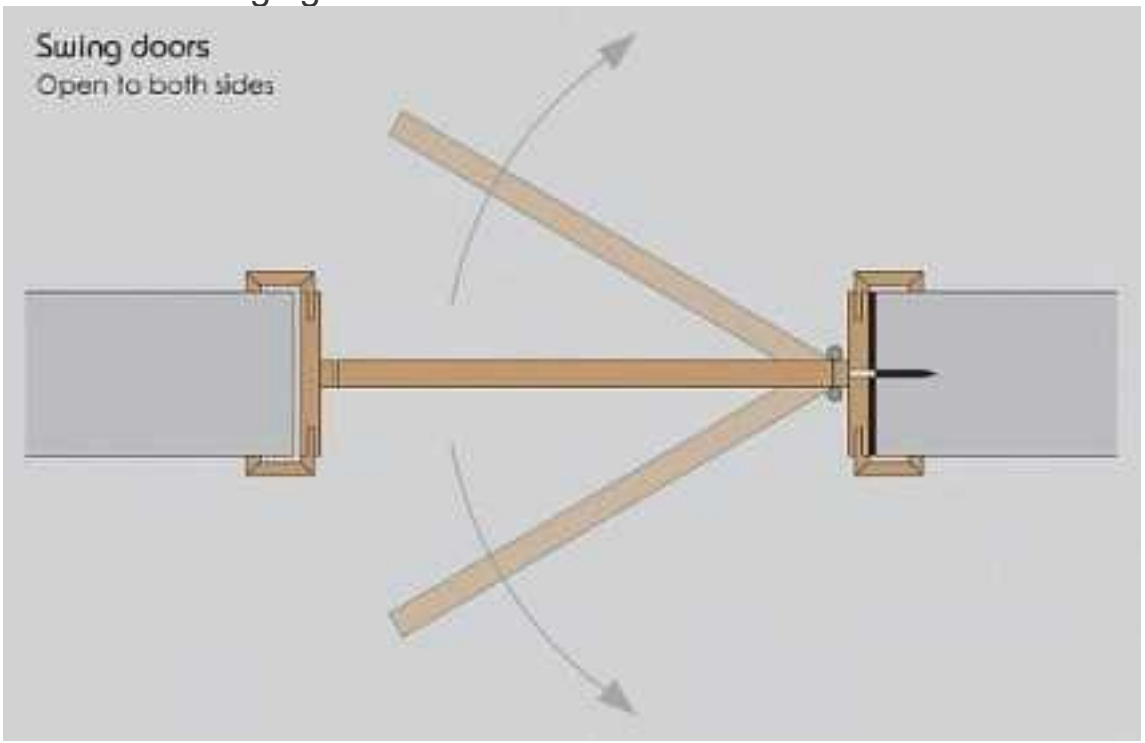
Composite Door

A composite door is a new invention which is depicted with the modernistic door technology. Lately, it has become the alternative to wooden, steel or UPVC door. It's not made from a single substance. Instead, it is made using a combination of material like PVC, wood, muffled foam and glass reinforced plastic (GRP). In most cases, it is made from fiberglass.

Swinging Door

The swinging door is a simplified and easy technique. It is mainly a swinging hurdle that will close the entrance to a room or building or vehicle. Swinging on a double hinge. it opens in either direction as automated. Sometimes it can swing open in both directions. Mostly, a swinging door is made of steel, metal, aluminum or solid MDF glass. It is especially important to get the hand and swing correctly as the transom is usually sloped and sealed. Specifying an incorrect hand or swing can

cause the door to the blind. It can be reversed or a normal swing. Nowadays, automatic swinging doors are much in demand.



Revolving Door

Newer revolving doors are the visual focus of an entrance. A revolving door consists of three or four stiff upright sections hanging on a mid shaft and rotates around a vertical axis. It allows a large number of people to pass in and out only by a gentle push. A revolving door is called "Door without Draft or Air" because it averts drafts and air pressure. As a result, it is energy efficient by saving 30% of energy cost. The very first revolving door was installed in a restaurant. Mostly, it is used in sports stadium, theme park or airport for bypass security.

Folding Door

Folding door ajars by folding back in sections. It is also known as "Bi-fold Door". Most of them are made of either wood, bamboo, aluminum or PVC. A folding door can be as good as the utility door. It provides fascinating design options such as freely moving, cabinet-hugging or guided systems. Nearly all time, the position of a folding door is exterior. From residences to restaurants and commercial projects, it has created an overwhelming call; can be used as a room divider too. If properly maintained, this door will perform for years to come.

Pivot Doors

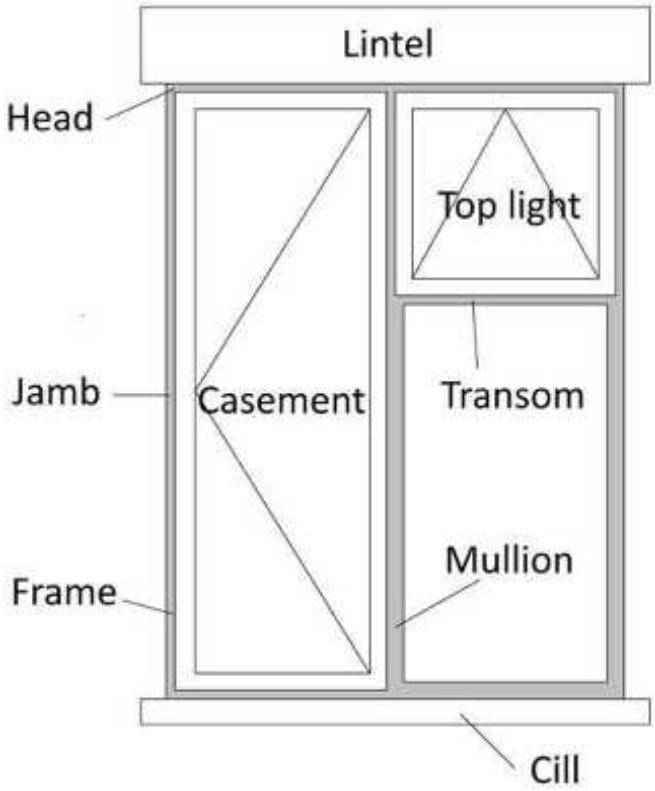
The pivot doors are simply designed to rotate about their vertical axis. These doors are available with or without a stopper.

this door can effortlessly rotate 360 degrees on its own axis thus achieving an elegant swing in the space.

What are the different types of doors?
The most common types of doors include hinged doors, sliding doors, French doors, pocket doors, and bi-fold doors.
What type of door is best for security?
Solid core doors and steel doors are typically the most secure types of doors.
What is the difference between an interior door and an exterior door?
Exterior doors are typically thicker and more durable than interior doors, and they are designed to withstand harsh weather conditions.
What are French doors?
French doors are a type of door that features glass panes and a frame that allows for natural light to enter a room, while still providing privacy.
What is a pocket door?
A pocket door is a type of sliding door that slides into a pocket or cavity in the wall, creating an unobtrusive and space-saving solution.
What is a bi-fold door?
A bi-fold door is a type of door that folds in half to create a compact opening, making it a popular choice for closets and laundry rooms.

WINDOWS

Windows are openings fitted with glass to admit light and allow people to see out. They are often openable to allow ventilation.



Windows are can include a number of different components:

- Light - The area between the outer parts of a window, usually filled with a glass pane.
- Frame - This holds the light in place and supports the window system.
- Lintel - A beam over the top of a window.
- Jamb - The vertical parts forming the sides of the frame.
- Sill (or cill) - The bottom piece in a window frame, often projecting beyond the line of the wall.
- Mullion - A vertical element between two window units or lights.
- Transom - A horizontal element between two window units or lights.
- Head - The uppermost member of the frame.
- Sash - The frame holding the glazing.
- Casement - A window (or sash) attached to its frame by one or more hinges.

Materials

It is important that windows be made of suitable and durable materials:

- With good thermal and sound insulation properties.
- Capable of resisting wind, and rain.
- Easy to clean.
- Providing safety and security.

Most styles of windows are available in a number of different materials. Traditionally, windows were made of timber, either hardwood or softwood, and often protected against decay using paint or a natural wood finish. This finish requires regular maintenance.

Steel and aluminium alloy windows are capable of creating larger areas of glass with a thinner frame.

PVC windows are capable of providing excellent heat and sound insulation, as well as requiring little maintenance. However, they may have a shorter life than a well-maintained timber window.

The efficiency of windows is improved by double glazing, treble glazing, low-e coatings, the construction of the frame, the type of glass, the gas used to fill the sealed unit and so on. Generally, more efficient windows are more expensive, but the capital cost may be recovered during the life of the window life through lower energy bills. In addition, the conditions within the enclosed space are likely to be more comfortable.

Types of Windows used in Buildings

There are different types of windows used in building construction to provide ventilation, and view. The selection of windows depends on many criteria. A window is a vented barrier provided in a wall opening to admit light and air into the structure and also to give outside view. Windows also increases the beauty appearance of building.

Selection Criteria for Windows Selection of suitable window in a particular place should be dependent of following factors. • Location of room • Size of room • Direction of wind • Climatic conditions • Utility of room • Architectural point of view Based on the above factors we can select the suitable window for our strictures.

.Types of Windows used in Buildings

There are so many types of windows are available based on their positions, materials and functioning. Windows are classified as follows. 1. Fixed windows 2. Sliding windows 3. Pivoted windows 4. Double hung windows 5. Louvered windows 6. Casement windows 7. Metal windows 8. Sash windows 9. Corner windows 10.Bay windows 11.Dormer windows 12.Clerestory windows 13.Lantern windows 14.Gable windows 15.Ventilators 16.Skylights

Fixed Windows

Fixed windows are fixed to the wall without any closing or opening operation. In general, they are provided to transmit the light into the room. Fully glazed shutters are fixed to the window frame. The shutters provided are generally weather proo

Sliding Windows

In this case, window shutters are movable in the frame. The movement may be horizontal or vertical based on our requirement. The movement of shutters is done by the provision of roller bearings. Generally, this type of window is provided in buses, bank counters, shops etc..

Pivoted Windows

In this type of windows, pivots are provided to window frames. Pivot is a shaft which helps to oscillate the shutter. No rebates are required for the frame. The swinging may either horizontal or vertical based on the position of pivots.

Double Hung Windows

Double hung windows consist of pair of shutters attached to one frame. The shutters are arranged one above the other. These two shutters can slide vertically with in the frame. So, we can open the windows on top or at bottom to our required level. To operate the double hung windows, a chain or cord consisting metal weights is metal provided which is connected over pulleys. So, by pulling the weights of cord the shutters can move vertically. Then we can fix the windows at our required position of ventilation or light etc..

Louvered Windows

Louvered windows are similar to louvered doors which are provided for the ventilation without any outside vision. The louvers may be made of wood, glass or metal. Louvers can also be folded by provision of cord over pulleys. We can maintain the slope of louvers by tilting cord and lifting cord. Recommended angle of inclination of louvers is about 45o . The sloping of louvers is downward to the outside to run-off the rain water. Generally, they are provided for bathrooms, toilets and privacy places etc..

Casement Windows

Casement windows are the widely used and common windows nowadays. The shutters are attached to frame and these can be opened and closed like door shutters. Rebates are provided to the frame to receive the shutters. The panels of shutters may be single or multiple. Sometimes wired mesh is provided to stop entering of fly's.

Metal Windows

Metal windows, generally mild steel is used for making metal windows. These are very cheap and have more strength. So, now days these are widely using especially for public buildings, private building etc. Some other metals like aluminum, bronze, stainless steel etc. also used to make windows. But they are costly compared to mild steel windows. For normal casement windows also, metal shutters are provided to give strong support to the panels.

Sash Windows

Sash window is type of casement window, but in this case panels are fully glazed. It consists top, bottom and intermediate rails. The space between the rails is divided into small panels by mean of small timber members called sash bars or glazing bars.

Corner Windows

As in the name itself corner windows are provided at the corners of room. That means corner windows has two faces in perpendicular directions. By providing this type of windows, light or air can be entered into room in two different directions. To provide this type of window special lintel is provided in the wall. Corner windows will give aesthetic appearance to the building.

Bay Windows

Bay windows are projected windows form wall which are provided to increase the area of opening, which enables more ventilation and light form outside. The projection of bay windows are of different shapes. It may be triangular or rectangular or polygonal etc. They give beautiful appearance to the structure.

Dormer Windows

Dormer windows are provided for sloped roofs. These are projected from the sloping surface as shown in below image. They provide ventilation as well as lighting to the room. They also enhance aesthetic sense of room.

Clerestory Windows

If the rooms in a building are of different ceiling heights, clerestory windows are provided for the room which has greater ceiling height than the other rooms. The shutters able to swing with the help of cord over pulleys. These also enhances the beauty of building.

Lantern Windows

Lantern windows are provided for over the flat roofs. The main purpose of this window is to provide the more light and air circulation to the interior rooms. Generally, they are projected from the roof surface so, we can close the roof surface when we required.

Gable Windows

Gable windows are provided for sloped roof buildings. These windows are provided at the gable end of sloped roof so; they are called as gable windows. They also improve the appearance of building.

Skylights

Skylights or generally provided on the top of sloped roofs. To admit light into the rooms, sky lights are provided. It is provided parallel to the sloping surface. Sky lights can be opened when we required. Lead gutters are arranged to frame to make it as waterproof.

Ventilators

Ventilators are provided for the purpose of ventilation in the room. They are provided at greater height than windows nearer to roof level. It is in very small size. Horizontally pivoted shutters are provided for ventilators. Sometimes shutter is replaced by wired mesh, in this case sunshade is provided to prevent against rain water

A ventilator may be defined as a narrow window of small height provided near the roof of a room for providing ventilation for the room. There are two types of ventilators, namely, (a) Wall ventilators, and (b) Roof ventilators

Wall and Roof Ventilators

Ventilators can be combined with a window or a door frame. Wall Ventilators These are provided on the walls, and the top of the ventilator should be close to the ceiling so that the vitiated air is removed through the ventilator. This consists of a frame and a shutter which is horizontally pivoted to the frame. The shutter can be opened or closed by means of two cords, one attached to its top rail and the other to the bottom rail.

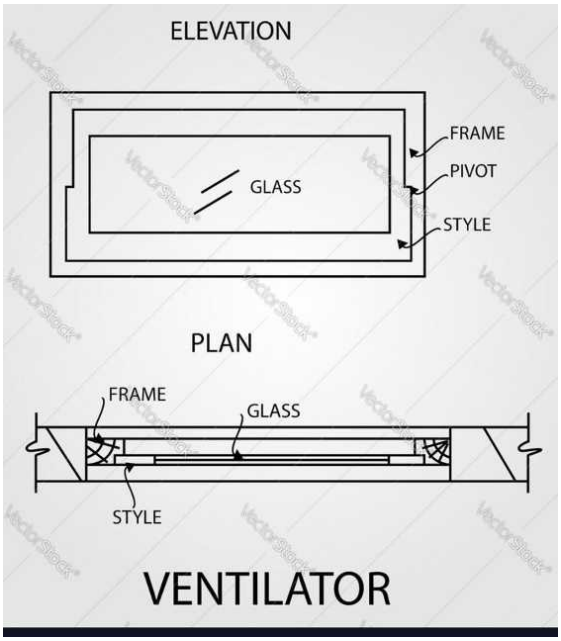
MATERIALS

VENTILATORS AND Fanlights are suitable for use in PVC,UPVC, timber, and aluminium window systems

Standard sizes of ventilator

The standard size of ventilator (vents) in residential home in feet is 2 feet long and 1.5 feet high, represented as 1.5 × 2 in feet, 450 × 600 in mm, 45 × 60 in cm, 0.45 × 0.60 in metres, or 18 × 24 in inches.

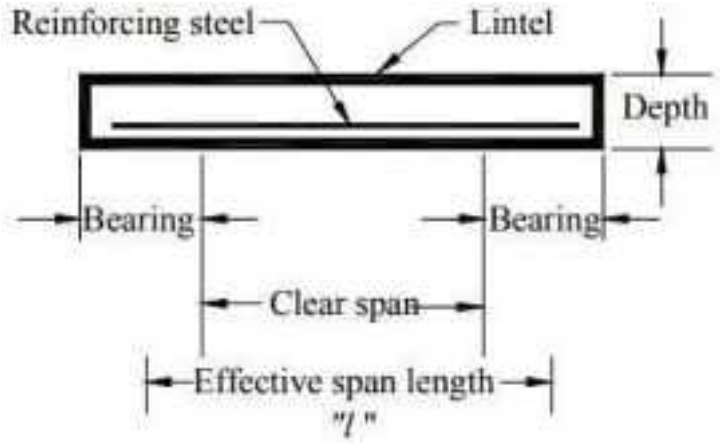
- **Kitchen - 2' × 2'**
- **Toilet - 1.5' × 2'**
- **Bathroom- 1.5' × 2'**
- **living room - 1' × 2'**
- **bedroom - 1' × 2'**



FANLIGHTS

Fanlights: The small window or ventilator fitted above the door or window frame separated by transom. The function is to ensure cross ventilation in the room even if the door or windows are closed. They also assist in admitting natural light.

LINTEL



What is a lintel?

A lintel is a beam placed across the openings like doors, windows etc. in buildings to support the load from the structure above. 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.

Lintel beam: Purpose

1. Lintel beams support the walls above doors, windows, or any form of opening.
2. They can protect the doors and windows by dividing the load to the side walls.
3. Lintel beams can also be used for decorative purposes to enhance the beauty of the structural design.
4. 150mm thick lintel is placed over window.

Standard height of lintel beam:-

The height between the floor level and lintel level is known as lintel height. As per the building regulations and guidelines, For residential building the

standard height of lintel beam could be 7 feet (2.1m) from floor and for the commercial buildings it is 7.5 feet (2.3 m) is adopted.

What is size of end bearing for lintel?

The size of end bearing for the lintel beam should be at least 200mm and width of lintel is the same as that of thickness of wall, it is always provided adequate bearing at the end of lintel, if not given enough in bearing the lintel will fail under load or pressure of Super structure of building.

Lintel beam size

Lintel beam size specification comprise of width and depth,the width of lintel beam should be equal to width of opening, if brick wall width is 5″ then lintel width should be 5″ (125mm), 9″ thick brick wall have lintel width is 9″(225mm)

Lintel beam size: the typical standard size of Lintel beam used for 4″ brick wall in a residential building is 4″×6″ (100 ×150 mm) and for 9″ wall is about 9″×6″ (230 × 150 mm) in which 4 inches and 9 inches is width of lintel beam and 6 inches is the minimum depth of the lintel beam

The minimum width of the lintel beam could be 100mm (or 4″) and maximum is about 230mm (9″) or which is equal to thickness of the opening.
The minimum depth of the lintel beam could be 150mm (or 6″) and the maximum is about 200mm (or 8″)

Lintel thickness: For a residential building, lintel beam thickness for house construction is between 100mm and 200mm (4″ and 8″), or an average 150 mm thick lintel beam should be adopted for residential and commercial building.

Lintel Beam: Size

Calculation of size depth and width of lintel:- suppose we have given opening is equal to 1 metre and end bearing 200mm at both end with 9 inch thick brick wall, width of lintel is equal to thickness of wall, so width of lintel is equal to 9 inch and lintel depth should be L/12, effective span L=1+0.2+0.2=1.4m, so lintel depth = 1.4/12= 116mm, it should be 120mm.

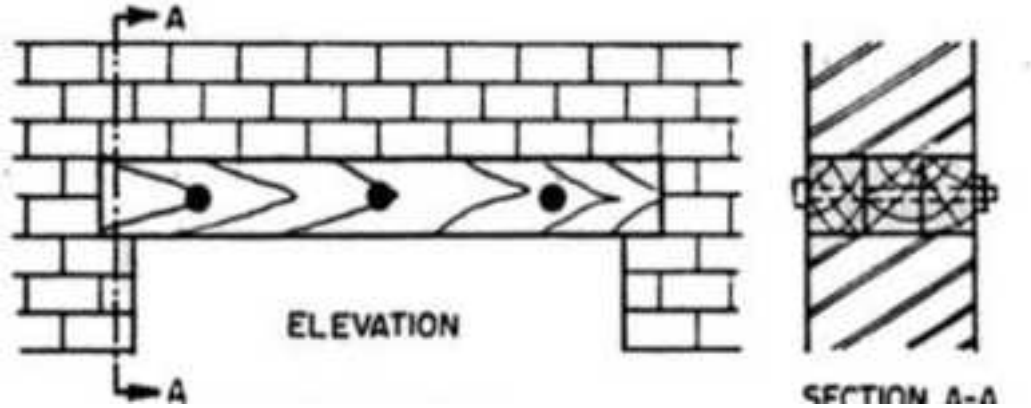
What are the types of lintel in construction?

Lintels are classified as:
1. Timber Lintels
2. Stone Lintels
3. Brick Lintels
4. Reinforced Brick Lintel

5. Steel Lintel
6. Reinforced Concrete Lintel

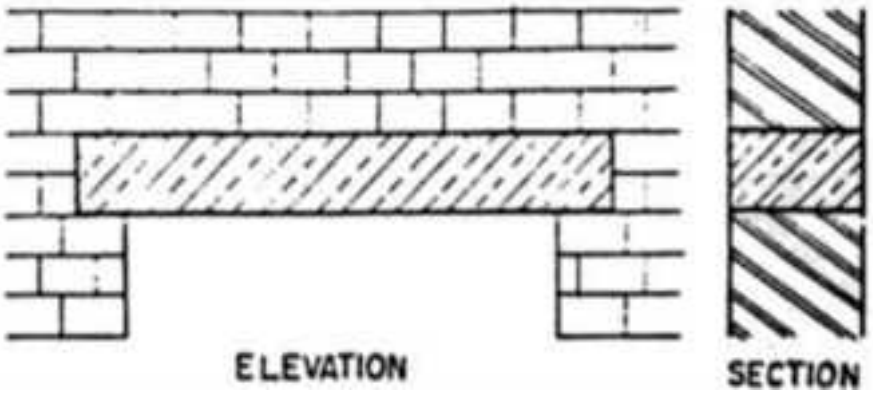
Timber Lintel

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.



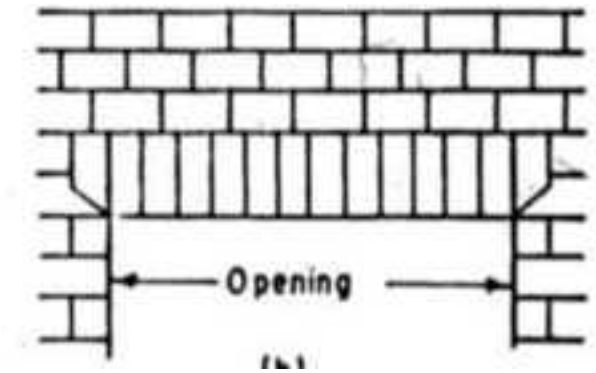
Stone Lintel

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.



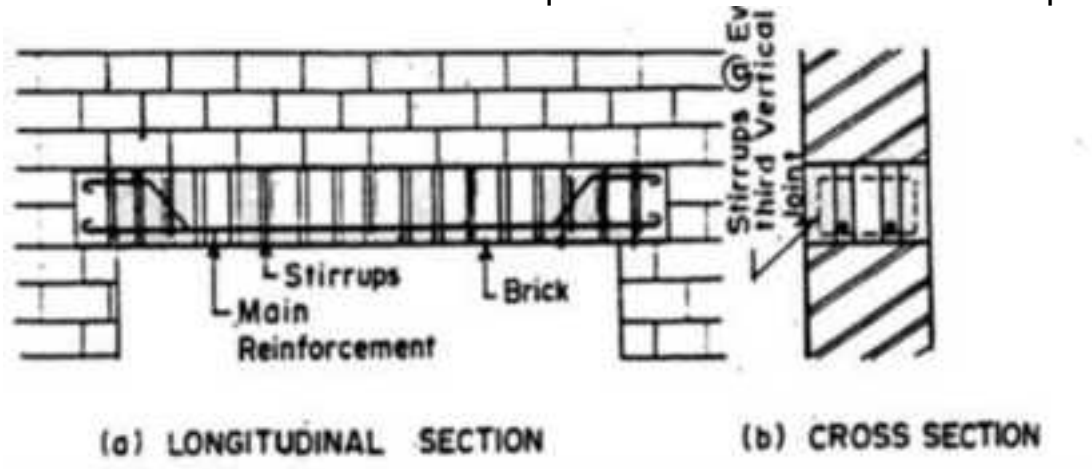
Brick Lintel

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.



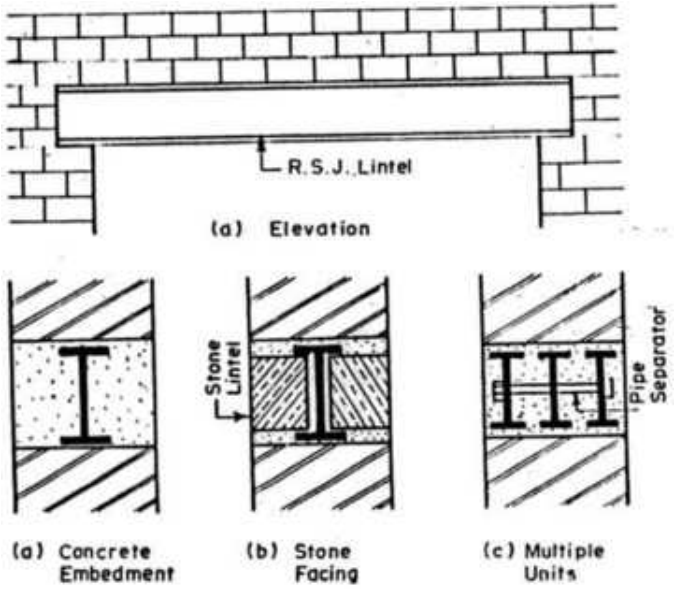
Reinforced Brick Lintel

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.



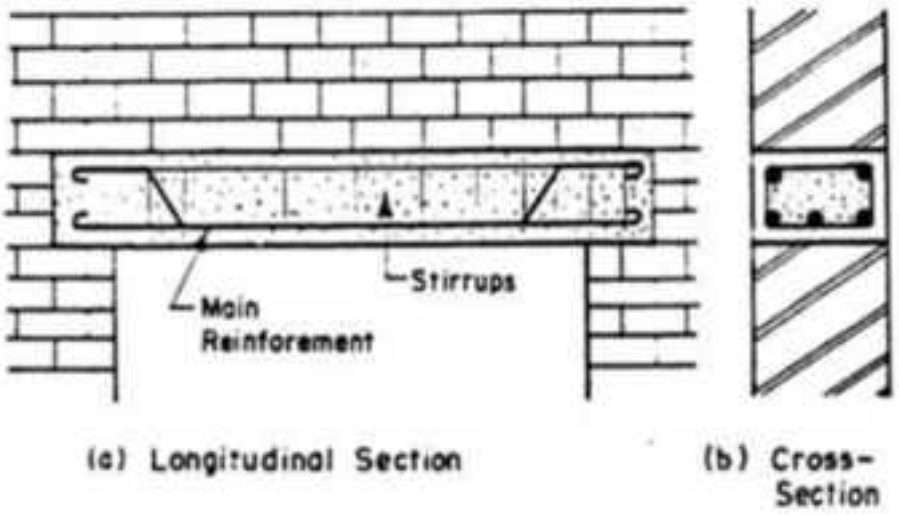
Steel Lintel

These are used when the superimposed loads are heavy and openings are large. These consist of channel sections or rolled steel joists.

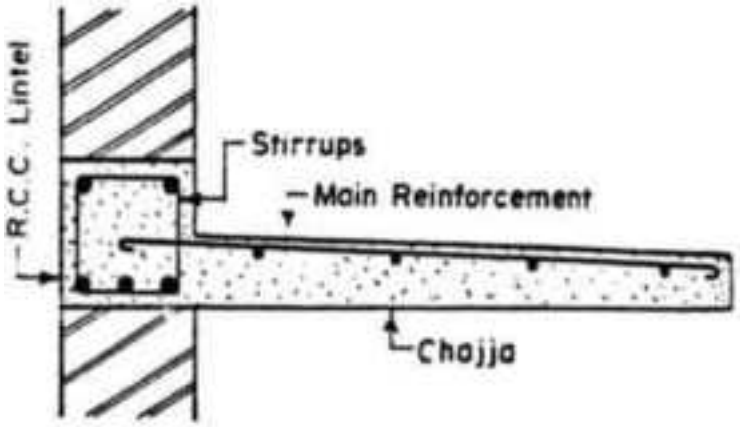


Reinforced Cement Concrete Lintel

At 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.



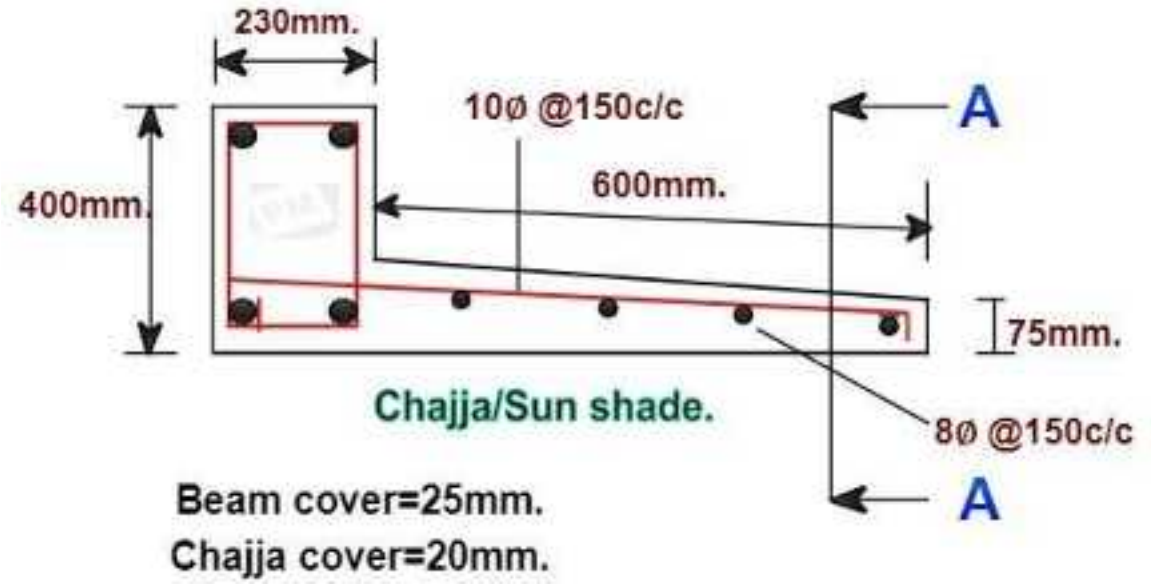
R.C.C lintel over a window with projection is displayed in below fig.



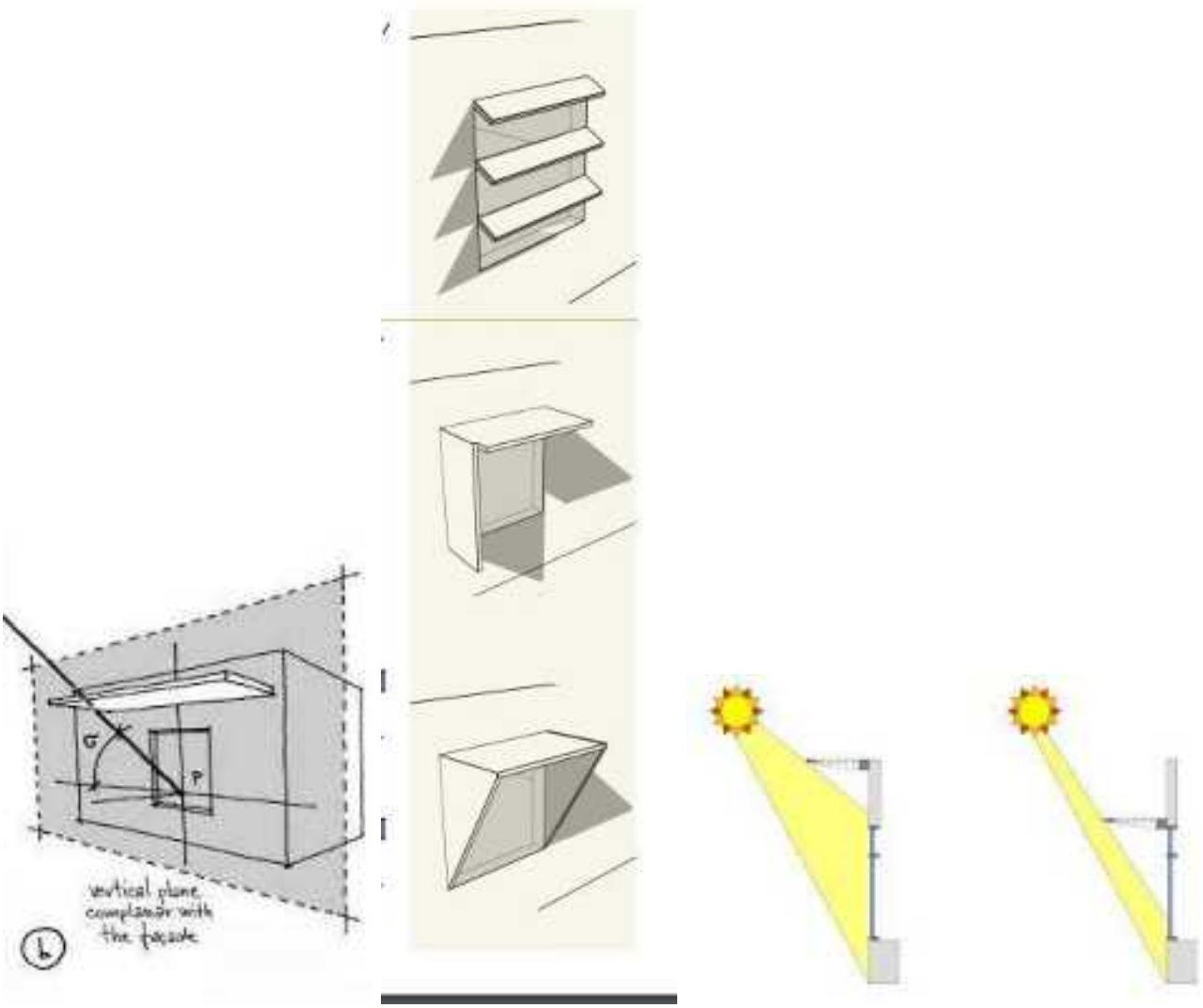
Uses of lintel beam

- The purpose of the lintel beam
- These beams are used to support the walls above openings such as windows and doors.
- For the safety of windows and doors, these beams are provided.
- These beams are provided to withstand the loads coming from the blocks or bricks above.
- It is provided to shift its loads to the side walls.
- Lintels are sometimes used as decorative architectural elements.

SUNSHADE


230mm.
10ø @150c/c
A
400mm.
600mm.
75mm.
Chajja/Sun shade.
8ø @150c/c
A
Beam cover=25mm.
Chajja cover=20mm.


SUNSHADE / WINDOW
DESIGNS



SUNSHADE/'Chajja' is located just above the window which provides shade and prevents rain from entering the window. So, Chajja is nothing but a 'Sun Shade'. Chajja meaning in English is also known as 'Sun Block' and ' Eaves'.

- It protects the house from external sunlight.
- It protects the house by providing a barrier for rain water to enter.
- It can be used to place the compressor of AC.
- Chajja helps to protect the wooden windows from rain and sun.
- Chajja serves as an aesthetic decoration to the building.

Chajjas are generally made of cements, concrete, woods, fibres sheet-asbestos materials. every building has chajjas. Chajja is a sunshade. Although Chajja is an overhang

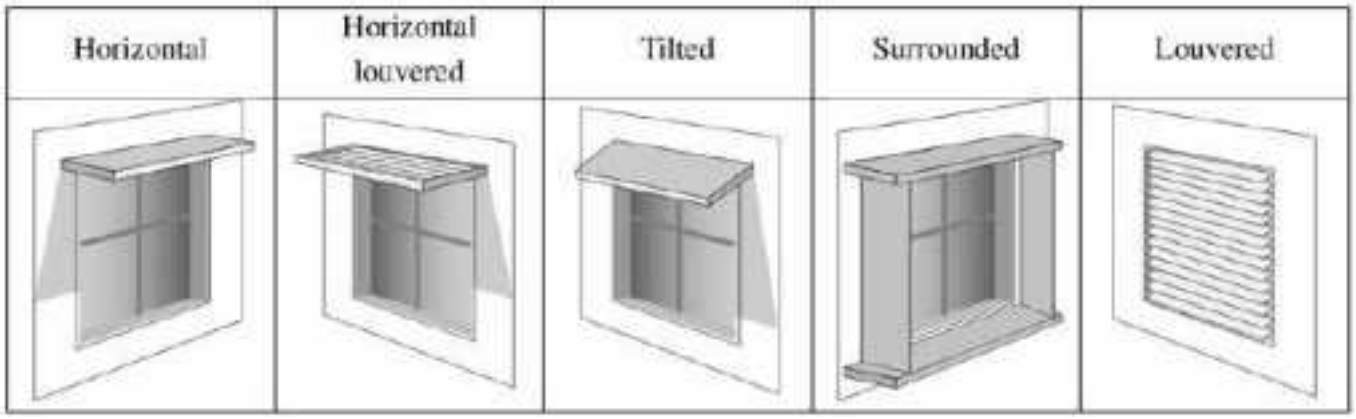
Sunshade considerations

Consider the following benefits:

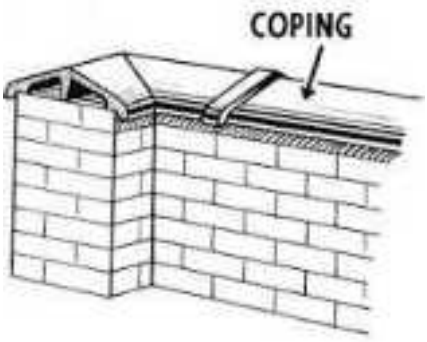
- Sunshades can help create dramatic savings in air conditioning requirements.

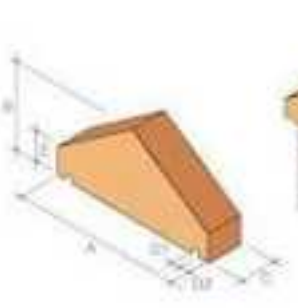
- Sunshades enable building occupants to use more natural, and less artificial light. They eliminate the need for interior window treatments or expensive, tinted or darkened glass, all of which increase artificial light requirements.
- Because there is more natural light, worker comfort and productivity are enhanced.

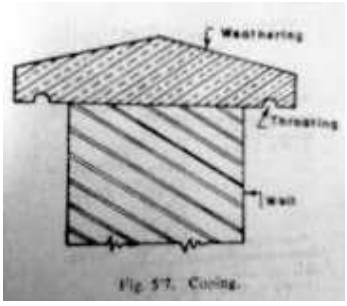
Types of sunshades

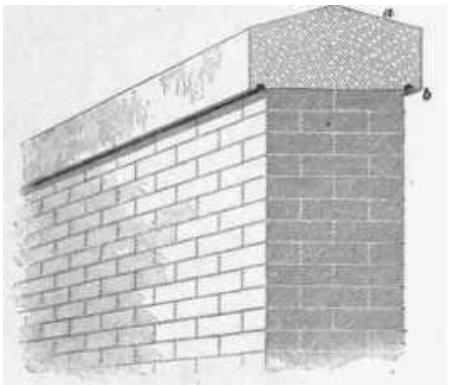


COPING









What is coping in construction?

Coping is a protective covering that prevents water seepage from entering the walls of buildings. It is used on compound walls, boundary walls and parapet walls to prevent water damage. The coping also gives the wall a good aesthetic look.

Types of coping

The coping materials vary from a variety of different building materials to include stone, concrete, masonry and metals. They come in a range of different shapes, colors and finishes to suit your commercial building's style.

Common coping material is metal, such as zinc, aluminum or copper. These are durable and can stand up to many harsh weather conditions, including strong winds, heavy rains and high temperatures.
The slope made to stop rainwater infestation is 1:20 from both sides.
Coping as a mechanism projects that the water will be thrown away from the surface of the wall below. This is done by including 10mm-wide semi-circular grooves cut into the underside of the coping projections.

Advantages and disadvantages of coping

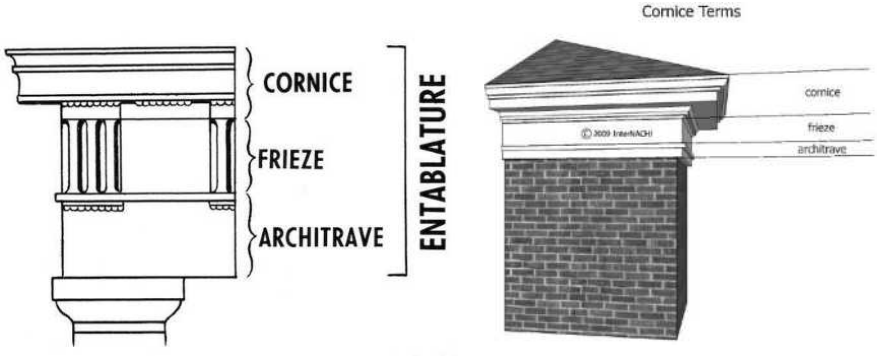
One major benefit of coping is that it reduces the risk of efflorescence - a fungus that grows on masonry. It also helps to keep a dripping wall from causing structural damage or wood rot.

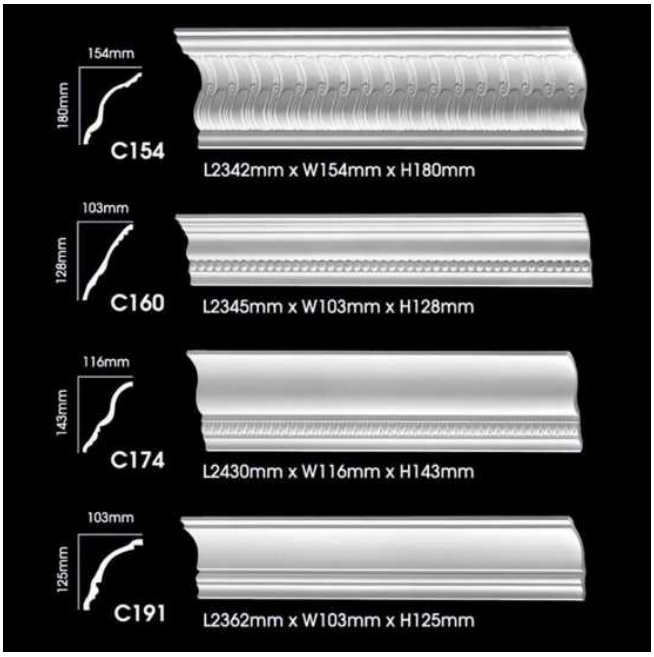
In a nutshell, copings have projections that throw rain as far away from the top of the wall as possible to help minimize efflorescence and other damage caused by the sun's UV rays. They are usually installed in conjunction with drip grooves cut into the underside of the projections to prevent rain from dripping back against the wall.

A coping should also be constructed with a slope to drain the collected water off the wall. It is also important to ensure that the coping material is resistant to frost and sulfate action as they are often exposed to temperature extremes and many wetting and drying cycles.

Since, coping done on the building has to weather extreme conditions, both rainy and sunny. It is made from strong material that will not be easily spoiled by the environment.

CORNICE





a cornice is the uppermost horizontal area that protrudes or sticks out, like moldings along the top of a wall or just below a roof line. It describes an area or space that overhangs something else..

The function of the cornice overhang is to protect the structure's walls. The cornice is traditionally by definition decorative.

Cornice

1. Any molded projection which crowns or finishes the part to which it is affixed.
2. The third or uppermost division of an entablature, resting on the frieze.
3. An ornamental molding, usually of wood or plaster, running round the walls of a room just below the ceiling; a crown molding; the molding forming the top member of a door or window frame.
4. The exterior trim of a structure at the meeting of the roof and wall; usually consists of bed molding, soffit, fascia, and crown molding.

Types of Cornices in Architectural History

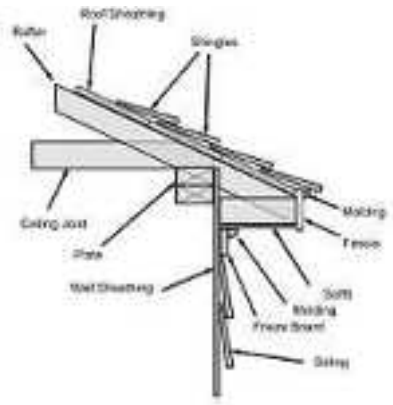
In ancient Greek and Roman architecture, the cornice was the uppermost part of the entablature. This Western building design can be found throughout the world, in various forms including:

- architrave cornice, which has no frieze beneath it
- cavetto cornice or Egyptian gorge

Cornice Types in Residential Architecture

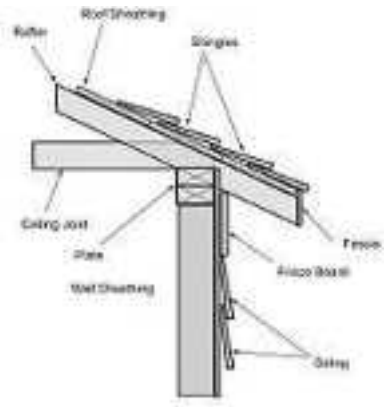
- **box cornice**

  Box cornices enclose the cornice of the building with what is essentially a long narrow box. A box cornice may further be divided into either the *narrow* box cornice or the *wide* box cornice type.



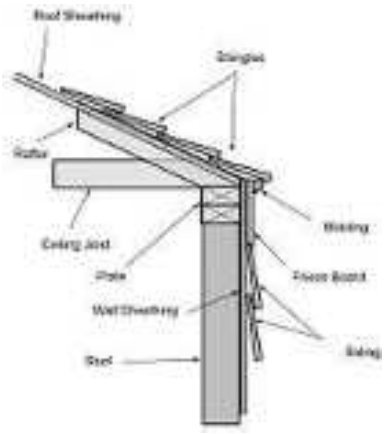
- **open or skeleton cornice,**

  In an open cornice, the shape of the cornice is similar to that of a wide box cornice except that both the lookouts and the soffit are absent. It is a lower-cost treatment that requires fewer materials, and may even have no fascia board, but lacks the finished appearance of a box cornice.



- **close or closed cornice,**

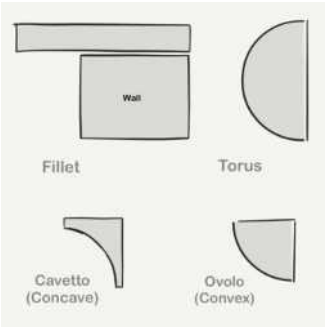
A close, closed, or snub cornice is one in which there is no projection of the rafters beyond the walls of the building, and therefore no soffit and no fascia. This type of cornice is easy to construct, but provides little aid in dispersing water away from the building and is sometimes considered to lack aesthetic value



- **Through-The-Cornice Dormers**

Most dormers are typically built above the roof line and the roof surrounds the dormer. But a more complex design is the wall dormer built straight up through the cornice or the roof's edge. These "through-the-cornice" dormers serve as a continuation of the wall above the roof eaves.

Different styles of cornice



Cavetto cornice

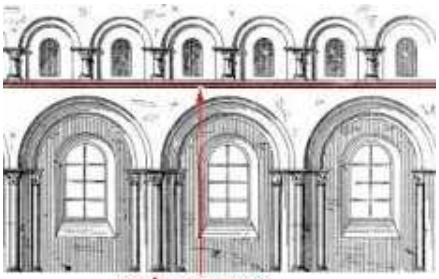
The characteristic cornice of most Egyptian buildings, consisting of a large cav etto decorated with vertical leaves, and a roll molding below.

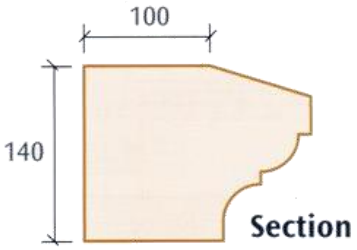
conclusion

Since an exterior cornice is decorative as well as functional, the decorative cornice has made its way to interior decor, including window treatments. The box-like structures over windows, hiding the mechanics of shades and drapes, are called window cornices. A door cornice may be a similar decoration, protruding over a door frame. These types of cornices often add an elegance and sophisticated formality to interiors.

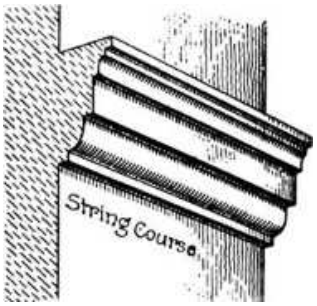
STRINGCOURSE

Elevation





Section



stringcourse, in architecture, decorative horizontal band on the exterior wall of a building. Such a band, either plain or molded, is usually formed of brick or stone. A thin projecting course of brickwork or stone that runs horizontally around a building, typically to emphasize the junction between floors. the stringcourse is used as a line of demarcation between the stories of a multistoried building.

In architecture terms the difference between cornice and stringcourse is that **cornice** is A horizontal architectural element of a building, projecting forward from the main walls, originally used as a means of directing rainwater away from the building's walls. while **stringcourse** is a thin projecting course of brickwork or stone that runs horizontally around a building, typically to emphasize the junction between floors.

What is the difference between cornice and coving?

Coving tends to be plainer and more regular in size, whilst cornice is more ornate, and may have different dimensions down the wall from across the ceiling.

What is the difference between cornice and parapet?

Cornice: Decorated trim work placed along the top of a wall. Parapet: A wall that extends above the roofline.

PARAPET

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Parapet Walls – Purpose, Types

What Does Parapet Wall Mean? - Parapet Definition

If a **short-height (3ft-4ft) wall** is built on the edge of the roof, balcony and terrace of the house, it is known as a parapet wall. It is also built on bridges and sidewalks. Various materials such as brick masonry, steel, RCC (reinforced cement concrete), aluminium, glass are used for parapet wall construction. It gives our home an attractive look.

It helps to improve the appearance of the house and also acts as a safety barrier for the occupants.

A parapet wall is a low-security structural layer built near the roof. this wall provides continuity and support in terms of water, air, steam and thermal control.

Control of these factors can help prevent degradation and corrosion of the roof or some other pre-built adjacent structure.

What are the uses of Parapet Walls? – Purpose

The terrace of the house is used by the occupants for sitting, relaxing, browsing and many other recreational activities. Therefore, the safety of the residents provided with the parapet should be ensured.

A parapet wall serves the following purposes.

Giving an aesthetic look to the structure.

Provide protection to prevent vehicles from falling off the bridge on bridges, even when humans are on the rooftop.

Prevent dust from entering the air through the roof.

To prevent concealment of equipment and machinery on the roof.
To prevent debris collected on the roof from falling.
Perforated walls will be useful for security operations in military areas.
To prevent excessive wind loads from coming on the roof

Height of Parapet Wall

The height of the parapet wall is an important factor to consider in constructing the wall.

The minimum thickness of a parapet wall is 4 ½ ”inches. 9” recommended

The standard minimum height of the parapet wall should be 3 feet – 900mm.

The parapet wall should not be built less than 3 feet. At this height, the wall protects and ensures safety.

What is called parapet?

A parapet is a barrier that is an upward extension of a wall at the edge of a roof, terrace, balcony, walkway or other structure.

What is an example of a parapet?

parapet, a dwarf wall or heavy railing around the edge of a roof, balcony, terrace, or stairway designed either to prevent those behind it from falling over or to shelter them from attack from the outside

Types of the parapet wall

In terms of appearance, the parapet wall can be classified as follows.

a) Plain Parapet
b) Paneled Parapet
c) Perforated Parapet
d) Embattled Parapet

a) Plain / Solid Parapet Wall:

These walls are solid structures that run across the length with no openings between them. They are more common where safety is a top priority rather than aesthetics.

1. Construction process easy.
2. Maintenance easy.

3. Supports the basic purpose of privacy and safety.
4. It does not give the best aesthetics to the building.

b) Paneled Parapet Walls or Double Walls:
These walls have projected shapes on a solid wall with no openings.

1. It is difficult to build.
2. Difficult to maintain. Dust and water will accumulate in the corners of the openings. The lack of openings makes it even harder to clean.
3. Supports the basic purpose of security and privacy.
4. It gives the best aesthetics to the building.

c) Perforated Parapet Walls:
These walls have openings in between, unlike a plain parapet wall. The openings can be of any shape. Since openings are provided, formwork should be used to support wall materials falling down. However, if pre-fabricated perforated steel is used, the process is much simpler.

d) Embattled Parapet Walls / Perpetrate Walls:
These are the first types of walls built by man. These walls have complete openings that are continuously provided at certain distances. In ancient times, these walls served the purpose of providing protection to archers during battle, while the openings helped to shoot arrows.

The parapet wall can be classified as follows based on shape and design.
a) Flat Parapet
b) Stepped Parapet
c) Sloped parapet
d) Curved Parapet

a) Flat Parapet Wall
This type of wall is widely used in buildings. Flat parapet walls are built without slope. Flat parapet walls are often used in homes, flat roof structures and commercial structures.

b) Stepped Parapet Wall
A stepped Parapet Wall is also used for wall sloping roof structures. This stepped Parapet Wall is built in the form of a staircase, which gives the building an attractive appearance.

c) Sloped Parapet Wall
These types of walls are provided for sloping roof systems such as industrial structures and trussed structures.

d) Curved Parapet Wall
This type of wall also called arched parapet walls are recommended for both inclined and flat rooftops.

Things To Keep In Mind While Construction Parapet Wall
1. It should be plastered from both faces to avoid dampness.
2. Water drain should be provided in the bottom of the wall to drain the rainwater
3. Minimum height of 3 feet.
4. Minimum thickness of 4 ½ inches

FINISHING

FINISHES IN BUILDINGS

- Finishing materials improve the appearance of buildings. There are different types of finishes and methods apply during the construction process of any type of building projects.
- Inherent finishes and applied finishes are two types of finish for the building fabric. Inherent finish provides natural finish because further work no needed for example materials such as stone and glass. Applied finishes are materials such as types of paint or plaster to timber or walls.

BUILDING FINISHES

- Building finishes such as plastering, varnishing, dis-tempering, white-washing, coloring, etc basically perform two functions as pointed below.
- They give a protective coating to the surfaces which protects them from weather effects such as rain water, frost, heat etc, and
- They provide decorative effects which add to the appearance of the surfaces and building as a whole.

TYPES OF BUILDING FINISHES

1. PLASTERING
This is the process of covering various surfaces of the structure with a plastic material such as cement mortar, lime mortar or composite mortar, etc to obtain an even, smooth, regular, clean and durable surface. Plastering conceals inferior

quality materials and defective workmanship and also provides a protective coating against atmospheric effects. It further provides a base for receiving other decorative finishes such as painting, white washing, etc.

2. POINTING

This is the process of finishing of mortar joints in exposed brick or stone masonry, which is achieved through two operations. Firstly, masonry joints in brick or stone are raked out to a depth of about 15 mm and then these spaces are filled up by a suitable mortar of richer mix. Pointing gives a good appearance to the masonry work and also prevents the entry of water into the wall.

3. PAINTING

This is the process of coating with paint as a final finish to all surfaces such as walls, ceilings, wood work, metal work, etc in order to protect them from weathering effects to prevent decay of wood and corrosion in metal, and over and above to obtain a clean, colorful and pleasing surface.

- Paint for three basic elements - walls, metal and wooden surfaces. In their lifetime, each of these will necessarily need painting because with time, their beauty and strength decreases.
- Wall surfaces chip and crack, metals rust and corrode, while wooden furniture and doors get warped and scratched. Different paints have specific properties that prevent, or at least delay this. They form a protective layer around the substrate, keeping it relatively safe. Naturally, since walls are different from metals, which in turn have properties dissimilar to wood, each surface requires a different type of paint. Today, different paints have been developed, specific to each category.
- Thus the main purposes of painting are:
- To protect the surface from rain, sunlight, weather, rust, chemical environment, heat, cold, termites etc.
- It enhances the aesthetic value and beautifies the painted surface.

4. VARNISHING

This is the process of applying varnish to the wooden surfaces and also to the painted surfaces, in order to improve their appearance and protect them from atmospheric actions.

5. DIS-TEMPERING

- Distemper was the main finish used on the plaster walls and ceilings of everyday interiors. The white chalk powder provided durability and also contributed to distemper's other name, 'Paris White'.
- This is the process of applying distemper over the plastered surfaces more easily and with lesser cost than paints and varnishes, to safeguard them against weather effects and improve their appearance. A distemper as water paint, consist of whiting (i.e. powered chalk), glue or casein which act as a

binder, and suitable proportions of fast colour pigments. For added durability, other binders might be included as well as size. For example, adding milk, casein (a cheese-making by-product) or linseed oil produced a 'washable distemper'.

- Distempers are readily available in a variety of different shades in the form of a stiff paste or dry powder in sealed tins.
- There are two types of distemper – oil bound distemper and dry distemper. Both of these are used as Interior paints for walls. Dry Distemper is a water based wall paint and its main constituents are chalk lime, glue and water. Distemper is normally brush applied and gives a better look than the traditional whitewash
- Distemper is non-alkali in composition, so is compatible with a wider range of pigments than limewash. The white chalk dilutes the intensity of pigments, however, and so distemper wasn't suitable where bold colours were required.

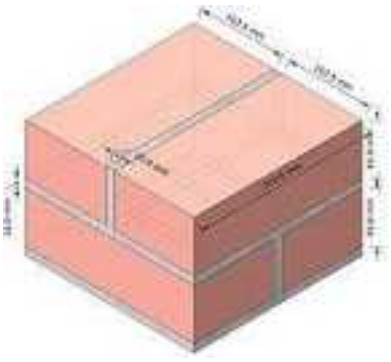
6. WHITE WASHING

In this process, a mixture of pure fat slaked lime in sufficient quantity of water is first prepared. It is then screened through coarse cloth and a mixture of boiled gum with rice in certain proportions is added to it. The solution so formed, called white-wash, is then applied by brushes to a specified number of coats, usually three.

7. COLOUR WASHING

It is similar to white washing except a coloring pigment of desired shade and nature, unaffected by lime, is added to white wash. Colour washing is applied in one or two coats only.

Mortar



Mortar Thickness in Brickwork

What is Mortar?

Mortar is a bonding agent which is generally produced by mixing cementing or binding material (lime or cement) and fine aggregate (sand, surki, sawdust, etc.) with water. Mortar is used to bind different building blocks like bricks, stones, etc. It can also add a decorative pattern in brick or stone masonry. Mortar is being used from the dawn of civilization. 2000 years ago, the Egyptians used lime mortars.

Mortar is produced by mixing a binding material (cement or lime) with fine aggregate (sand, surki, etc) with water. For construction purpose, different types of mortar are used. Depending upon the materials used for mortar mixture preparation, the mortar could be classified as follows.

1. Cement Mortar
2. Lime Mortar
3. Surki Mortar(Surkhi is the powdered form of over burnt bricks or clay balls.)
4. Gauged Mortar(Gauged mortar: (i) It is a mixture of cement, lime, sand, and water.)
5. Mud Mortar

Cement Mortar

Cement mortar is a type of mortar where cement is used as binding material and sand is used as fine aggregate. Depending upon the desired strength, the cement to the sand proportion of cement mortar varies from 1:2 to 1:6.

Lime Mortar

Lime mortar is a type of mortar where lime (fat lime or hydraulic lime) is used as binding material and sand is used as fine aggregate. The lime to the sand proportion of cement mortar is kept 1:2. The pyramids at Giza are plastered with lime mortar.

Gauged Mortar

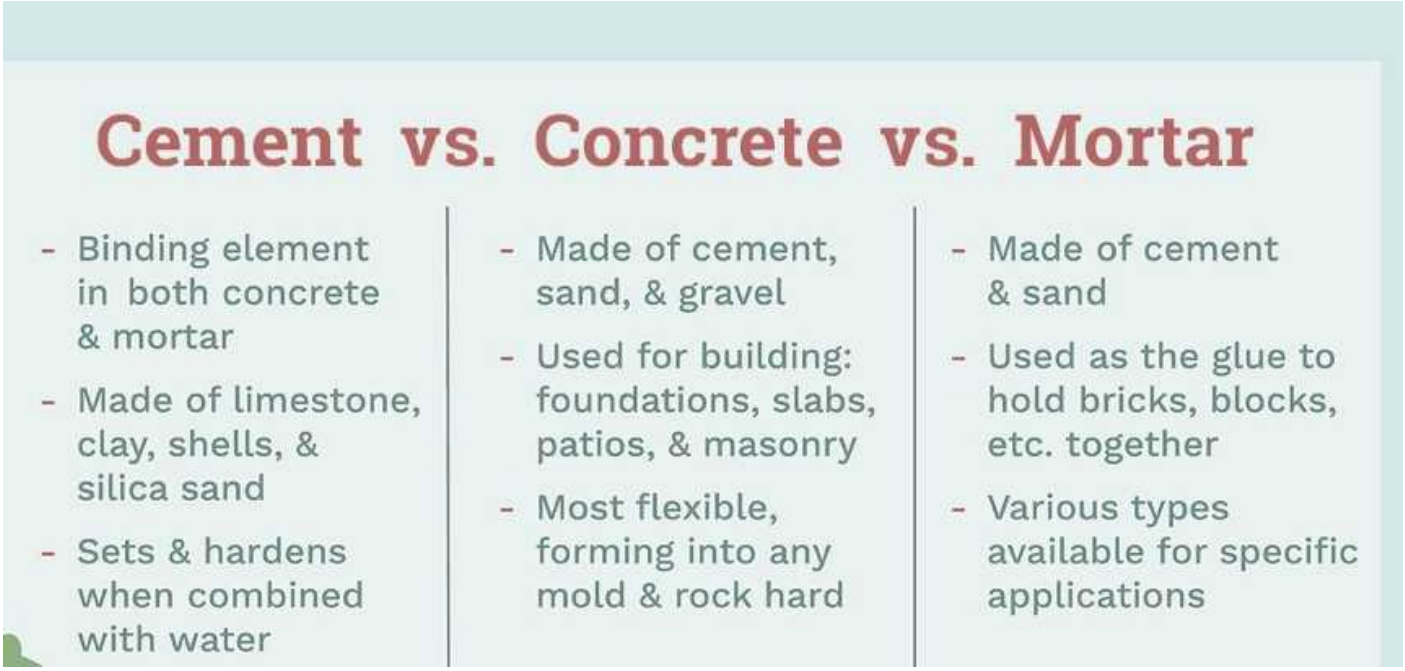
Gauged mortar is a type of mortar where cement and lime both are used as binding material and sand is used as fine aggregate. Basically, it is a lime mortar where cement is added to gain higher strength. The process is known as gauging. The cement to the lime proportion varies from 1:6 to 1:9. Gauged mortar is economical than cement concrete and also possess higher strength than lime mortar.

Surki Mortar

Surki mortar is a type of mortar where lime is used as binding material and surki is used as fine aggregate. Surki mortar is economic.

Mud Mortar

Mud mortar is a type of mortar where mud is used as binding material and sawdust, rice husk or cow-dung is used as fine aggregate. Mud mortar is useful where lime or cement is not available.



DECORATION

Building should be functional but should also be aesthetically charming from inside and outside. Different types of material like metamorphic rocks, precious stones, dyes, and other artificial and natural beautifying products are used to decorate the building.. Some of these products even used in accordance with climatic conditions. Use of glass is very common in the buildings.

ornamentation, in architecture, applied embellishment in various styles that is a distinguishing characteristic of buildings, furniture, and household items.

Why is decoration important

The purpose of decoration is to improve the appearance of a space. It can add color, visual interest, and texture to a room, making it more pleasing to look at. Decoration can also be used to make a space feel more comfortable or inviting.

PAVING

Paving is flat blocks of stone or concrete covering an area.

Pavement, in construction, is an outdoor floor or superficial surface covering. Paving materials include asphalt, concrete, stones such as flagstone, cobblestone, and setts, artificial stone, bricks, tiles, and sometimes wood. In landscape architecture, pavements are part of the hardscape and are used on sidewalks, road surfaces, patios, courtyards, etc.

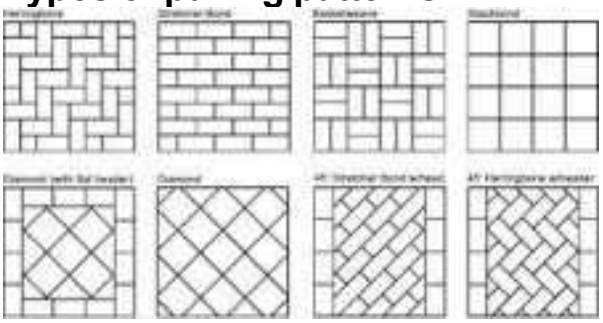
Concrete pavers

An interlocking concrete paver is a type of paver. This special type of paver, also known as a *segmental paver*, has emerged over the last couple of decades as a very popular alternative to brick, clay or concrete.[5] An interlocker is a concrete block paver which is designed in such a way that it locks in with the next paver. The locking effect allows for a stronger connection between pavers and with this interlocking effect the paving itself is resistant to movement under traffic


Stone pavers

A stone paver is another type of paver. This type of paver is used widely in building and landscaping as it is highly prized for beauty, strength and durability. Stone pavers are made of many materials including limestone, bluestone


Types of paving patterns



BASIC MATERIALS FOR THE COMPONENTS

building material

Building material is any material used for construction purpose such as materials for house building. Wood, cement, aggregates, metals, bricks, concrete, clay are the most common type of building material used in construction. The choice of these are based on their cost effectiveness for building projects. Many naturally occurring substances, such as clay, sand, wood and rocks, even twigs and leaves have been used to construct buildings. Apart from naturally occurring materials, many man-made products are in use, some more and some less synthetic. The manufacture of building materials is an established industry in many countries and the use of these materials is typically segmented into specific specialty trades, such as carpentry, plumbing, roofing and insulation work. This reference deals with habitats and structures including homes.

Mud and clay

The amount of each material used leads to different styles of buildings. The deciding factor is usually connected with the quality of the soil being used. Soil and especially clay is good thermal mass; it is very good at keeping temperatures at a constant level. Homes built with earth tend to be naturally cool in the summer heat and warm in cold weather. Clay holds heat or cold, releasing it over a period of time like stone..

Wood

Wood is a product of trees, and sometimes other fibrous plants, used for construction purposes when cut or pressed into lumber and timber, such as boards, planks and similar materials. It is a generic building material and is used in building just about any type of structure in most climates. Wood can be very flexible under loads, keeping strength while bending, and is incredibly strong when compressed vertically. There are many differing qualities to the different types of wood, even among same tree species. This means specific species are better for various uses than others. And growing conditions are important for deciding quality. Historically, wood for building large structures was used in its unprocessed form as logs. The trees were just cut to the needed length, sometimes stripped of bark, and then notched or lashed into place.

Timber:

Timber is one of the oldest type of building materials whose use is now limited to making doors, windows, closets, cabinets, shelves, concert halls, wooden sleepers and interior decoration. The most commonly used timber from oak, ash, poplar, pine, fir, cypress, walnut, redwood or even plywood. Timber improves the beauty of the building.

Uses:

Timber structure, floors, walls, roofing frames, door, windows, furniture, interior decoration, etc.

Brick

A brick is a block made of kiln-fired material, usually clay or shale, but also may be of lower quality mud, etc. Clay bricks are formed in a moulding (the soft mud method), or in commercial manufacture more frequently by extruding clay through a die and then wire-cutting them to the proper size (the stiff mud process). Bricks were widely used as a construction material in the 1700, 1800 and 1900s. This was probably due to the fact that it was much more flame retardant than wood in the ever crowding cities, and fairly cheap to produce.

THUS Bricks are rectangular blocks usually made from clay or mud and hardened by heating or chemical process. Bricks are set with mortar which acts as an adhesive to hold them in place and withstand the loads acting on them.

Nowadays, bricks are also available in different varieties made from concrete, fly ash, lime, calcium silicate, ceramics, etc. Out of them, concrete bricks are gaining popularity in modern construction.

Uses:

Bricks are used in masonry walls, paths, driveways, fireplaces, etc.

Stone:

Stone is also one of the oldest types of building materials used since ancient times. Stone masonry is made using natural stones and mortar. The most common types of stones are sandstone, granite, marble, limestone, and laterite. Stone masonry is mostly followed in areas that have locally available stones.

Stone masonry gives a superior appearance to the building and is mostly not plastered to manifest the beauty of the stones. The major drawback is that naturally occurring stones are of different sizes and shapes which may be difficult to use in masonry construction.
Uses:
Stone is used for building foundations, floors, retaining walls, arches, walls and columns.

Bamboo:
Bamboo is amongst the oldest and traditional construction materials used since ancient times. Bamboo is recognized as wood but technically it is a species of grass. With the improvement of technology, the use of bamboo in modern construction has been reduced.
Uses:

- Bamboo structures, bamboo houses.
- Bamboo roofing,
- Bamboo wall.
- Bamboo in foundation (There are limitations).
- Bamboo as an alternative to steel reinforcement.

UNIT II
MEASURED DRAWING AND PROJECTIONS OF BASIC COMPONENTS INTRODUCTION TO CONCEPT OF SCALE AND MEASURED DRAWING THROUGH BASIC COMPONENTS SUCH AS HANDRAILS, FURNITURE, ARCHES, ETC., ORTHOGRAPHIC (PLAN, ELEVATION, SECTION) AND ISOMETRIC PROJECTION OF THE SIMPLE COMPONENTS. REPRESENTATION OF DIFFERENT MATERIALS THROUGH RENDERING, PERSPECTIVE PROJECTION OF SIMPLE COMPONENTS.

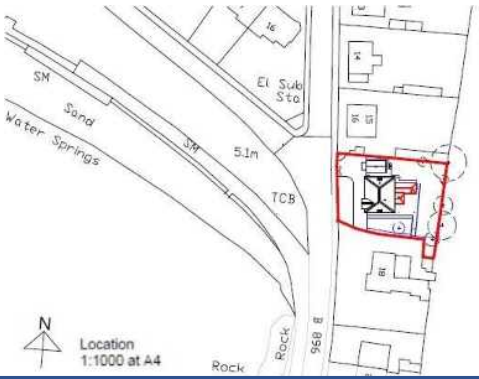
INTRODUCTION TO CONCEPT OF SCALE
Usually the word scale is used for an instrument used for drawing straight lines. But actually in Engineer's language scale means the proportion or ratio between the dimensions adopted for the drawing and the corresponding dimensions of the object. It can be indicated in two different ways. Example: The actual dimensions of the room say 10m x 8m cannot be adopted on the drawing. In suitable proportion the dimensions should be reduced in order to adopt conveniently on the drawing sheet. If the room is represented by a rectangle of 10cm x 8cm size on the drawing sheet that means the actual size is reduced by 100 times
Representing scales: The proportion between the drawing and the object can be represented by two ways as follows:
a) Scale: - 1cm = 1m or 1cm=100cm or 1:100

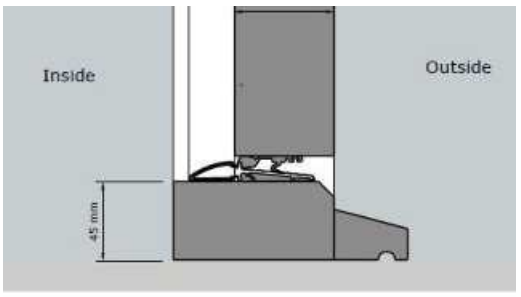
b) Representative Fraction: - (RF) = 1/100 (less than one) i.e. the ratio between the size of the drawing and the object.
Representative fraction is the ratio of the length of the object represented on drawing to the actual length of the object represented.

$$R.F. = \frac{\text{Length of the drawing}}{\text{Actual length of object}}$$

There are three types of scales depending upon the proportion it indicates as
1. Reducing scale: When the dimensions on the drawing are smaller than the actual dimensions of the object. It is represented by the scale and RF as
Scale: - 1cm=100cm or 1:100 and by RF=1/100 (less than one)
2. Full scale: Some times the actual dimensions of the object will be adopted on the drawing then in that case it is represented by the scale and RF as
Scale: - 1cm = 1cm or 1:1 and by R.F=1/1 (equal to one).
3. Enlarging scale: In some cases when the objects are very small like inside parts of a wrist watch, the dimensions adopted on the drawing will be bigger than the actual dimensions of the objects then in that case it is represented by scale and RF as
Scale: - 10cm=1cm or 10:1 and by R.F= 10/1 (greater than one)

There are several different types of scales, but mainly use the architect's scale, engineer's scale, and metric scale.
Architectural scales units are based on foot/inch dimensions. The major divisions are indicated as 3⁄32, 1⁄16, 1⁄8, 3⁄16, 1⁄4, 3⁄8, 1⁄2, 3⁄4, 1, 11⁄2, and 3. Each one of these divisions represents one foot on the scale. For example, the 1⁄4 scale means 1⁄4 of an inch on the scale represents 1 foot
Engineers Engineering Scales units of measure are equal to parts per inch and parts per foot. The engineer's scale generally contains 6 different divisions/scales. These divisions are indicated as 10, 20, 30, 40, 50, and 60. These numbers mean "parts to an inch." For example, the 40 scale means 1 inch = 40 feet.
Metric Engineering Scales - metric scale measurements is the standard in most of the world. The principles are similar. Metric scales are usually based on ratios. The millimeter is the basic unit of the metric scale. Metric scales are based on ratios, such as 1:50, which means 1 mm on the scale represents 50 mm. typical ratios are 1:10, 1:25, 1:50, 1:100, 1:200, and 1:500





What are scale drawings**?**

Scale drawings are drawings that represent something at a size other than their full size. They can represent things at either a larger or a smaller scale than full size, depending on the size of the thing they are representing and the use to which the drawing will be put. The scale describes the ratio between a distance at full size, and the distance at the scale used that would be the same length.

What are scale drawings **used for?**

Scale drawings are used to illustrate items that it is not useful or convenient to draw at their actual size. This may be because drawing the item at full size would be unmanageable, or would not easily fit on a single sheet of paper (such as a building), or alternatively because items need to be drawn larger than full size to adequately represent all the detail that needs to be communicated (such as a complex connection).

The scale of drawings is described as a ratio using the notation:

A distance at full size : The distance at the scale used that would be the same length.

For example:

- A full size drawing would be 1:1 (or sometimes 1/1 or ‘one to one’).
- A half size drawing would be 1:2.
- A tenth size drawing would be 1:10.
- A double size drawing would be 2:1.

What are the most commonly used scales for drawings?

In the construction industry a range of scales are generally used depending on the nature of the drawing. For example:

- A location plan at 1:1000.
- A site plan at 1:200.
- A floor plan at 1:100.
- A room plan at 1:50.
- A component drawing at 1:5.

- An assembly drawing at 1:2.

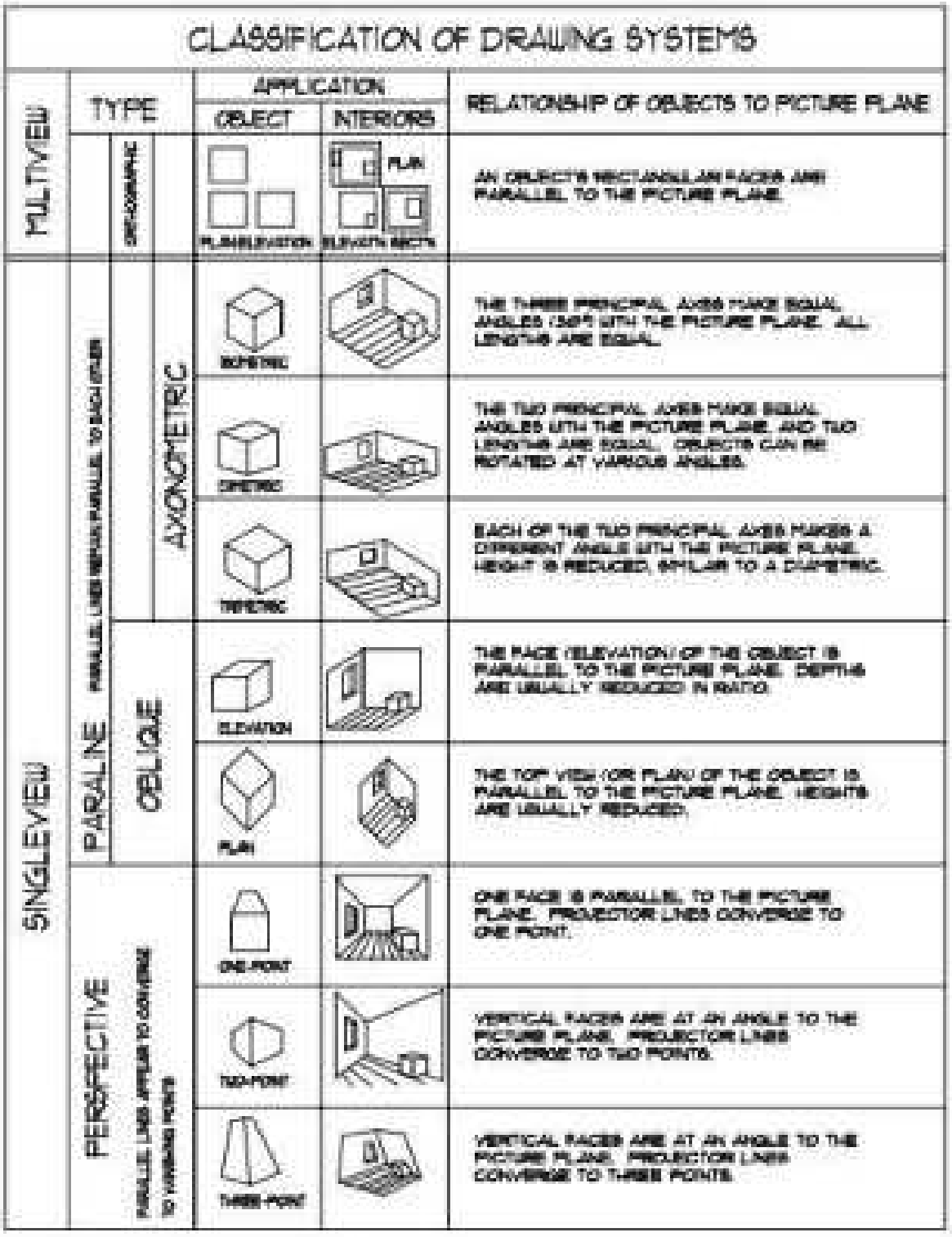
How should scales be used on drawings?

.The term scale describes the relationship between a depiction of a building, object, area of land etc compared to its actual size. Scale us usually expressed as a ratio of one unit of the represented scale compared to the actual full size dimension. So full scale is 1:1, whereas a scale on fifth of the actual size is 1:5.

architecture deals with different types of scale:

- Human scale: The human interaction with environments based on physical dimensions, capabilities and limits. Buildings can be designed with greater or lesser adherence to the concepts of human scale depending on the concept and purpose of the building.
- Intimate scale: This is a smaller, more personal scale.
- Monumental scale: This is much larger than human scale and is intended to be impressive, e.g. public buildings, memorials, religious buildings, and so on.
- Proportion: This refers to the relative size of parts of a whole, the relationship between two things of different size.

ORTHOGRAPHIC (PLAN, ELEVATION, SECTION)



ORTHOGRAPHIC PROJECTIONS

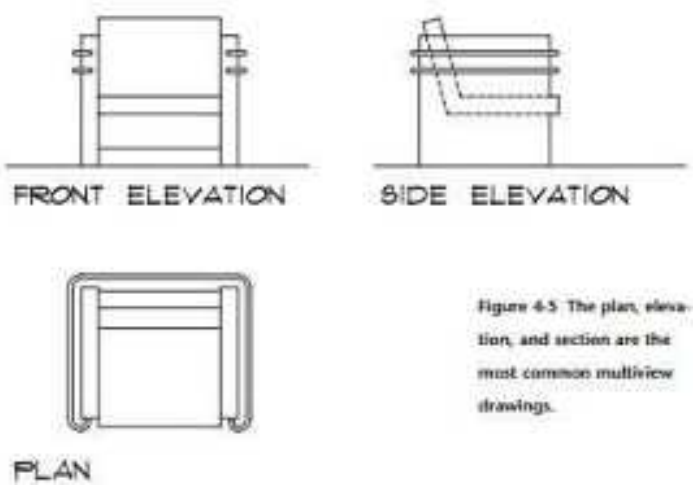
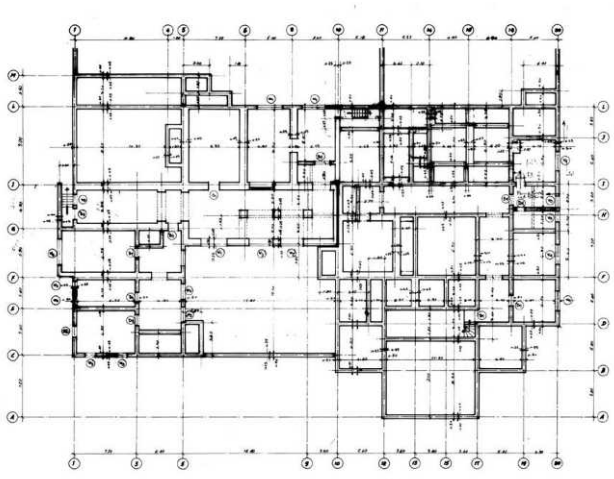


Figure 4-5 The plan, elevation, and section are the most common multiview drawings.

The word orthographic refers to the projection system that is used to derive multiview drawings based on the glass box model. Drawings that appear on a surface are the view a person sees on the transparent viewing plane that is positioned perpendicular to the viewer's line of sight and the object. In the orthographic system, the object is placed in a series of positions (plan or elevation) relative to the viewing plane. The most common types of orthographic drawings are the plan, elevation, and section (Figure 4-5). However, no single one of these drawings can communicate the actual configuration of a three-dimensional object or space. Multiview drawings lack the pictorial effect of perspectives (which are a type of single-view drawing), yet are more accurate for conveying correctly scaled objects, interiors, and building.

PLAN

.The object can be viewed from above (called a plan view) or the side (called an elevation view).



Floor plans are a form of orthographic projection that can be used to show the layout of rooms within buildings, as seen from above. They may be prepared

as part of the design process, or to provide instructions for construction, often associated with other drawings, schedules, and specifications.

Floor plans may include key dimensions and levels, and may also use, hatching, symbols and other standard annotations and abbreviations to indicate materials, fittings and appliances, and so on.

Depending on the size of the building, floor plans are typically drawn at scales of between 1:200 and 1:20. Different line types, colours and weights can be used to differentiate between the types of drawn information they include.

Floor plans can be drawn for whole buildings, a single floor of a building, or just a single room. The more detailed the floor plan is in terms of layout, fittings and so on, the more useful and instructive it will be for the project. However, if spaces are complex, it is normal for separate drawings to be prepared for different trades, such as electrical and lighting drawings, plumbing drawings, and so on.

The lower-right-hand corner of the sheet is typically reserved for a title block. This provides a space to record the name of the project, the name of the drawing, the scale, the originators name, the date, revision history, and so on.

The floor plan view should be roughly centred on the sheet, with the front of the building typically drawn along the lower side of the sheet. A north point may be included to show the orientation of the floor plan.

Typically, the outside walls are drawn first, to lay the plan out on the sheet, then the internal walls, then windows, doors, stairs, lifts, ramps, and so on, are added. An arrow is used to indicate the upward direction of stairs and ramps. It is usual for a faint dotted line to be drawn around stairs (or other openings) where they are open at ceiling level.

Rooms should be clearly labelled, with block lettering in the centre of each room. The correct symbols should be added for elements such as; appliances, fixed furniture, fittings, building services, and so on.

Electrical symbols should be added to the drawing, indicating; power sockets, light switches, wall and ceiling lights, detectors and alarms, extract fans, and so on.

Items that are ceiling mounted, are generally drawn on the floor below their place of installation.

Dimension may be added to indicate the size and location of key elements such as; rooms, fittings, appliances or fixtures, external walls, window and door openings, and so on.

Section lines may be added where there are section drawings associated with the floor plan. Grid references may also be added to help co-ordinate the floor plan with other drawings.

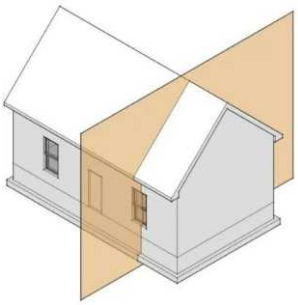
Some floor plans may include notional furniture to help gauge the likely size of circulation spaces.

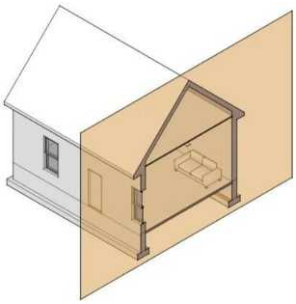
If a window or door schedule is to be prepared, doors and windows may be labelled with a number or letter, corresponding to an item on the schedule.
Floor plans should not duplicate information that is presented in specifications or schedules because of the potential for conflict. Instead they should refer to the specification or schedule

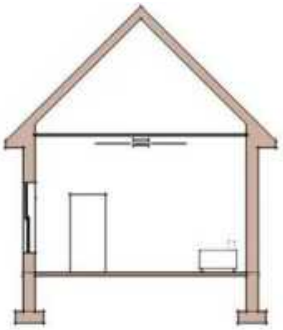
SECTION

.What is a section drawing?

A section is an orthographic 2D drawing that uses an imaginary vertical plane to "cut" the building. On one side of the plane, the building is removed so that the construction of whatever is sliced can be seen. The slice is typically made perpendicular to the wall it is cutting through. It may or may not show the building elements in elevation beyond.





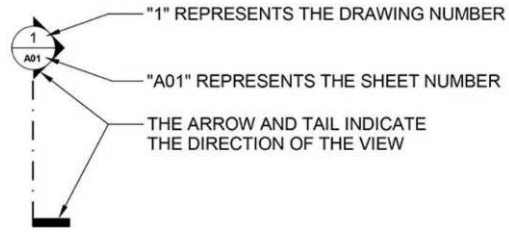


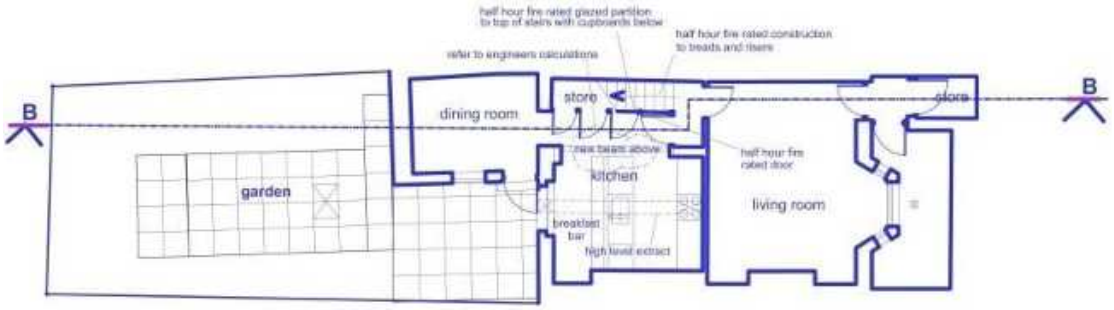
The sections are generally cut through the entire building, through typical conditions unique spaces, complex volumes, and a-typical conditions that need more explanation.
Sections are essential because when a building is only viewed in elevation, many of the elements seen cannot be fully understood.

represented with a heavier line weight which helps to make that portion of the drawing “pop.” The elements that are cut are then hatched, either generally showing that it’s a solid element or with a specific hatch to indicate the type of material. The voids will show everything beyond with a lighter line weight.

Shading, cross hatching or other fill styles and / or thicker lines can be used to indicate parts of the structure that have been cut through, such as walls, roofs and floors.

Section cuts are indicated on the plans and elevations with the following symbols below.

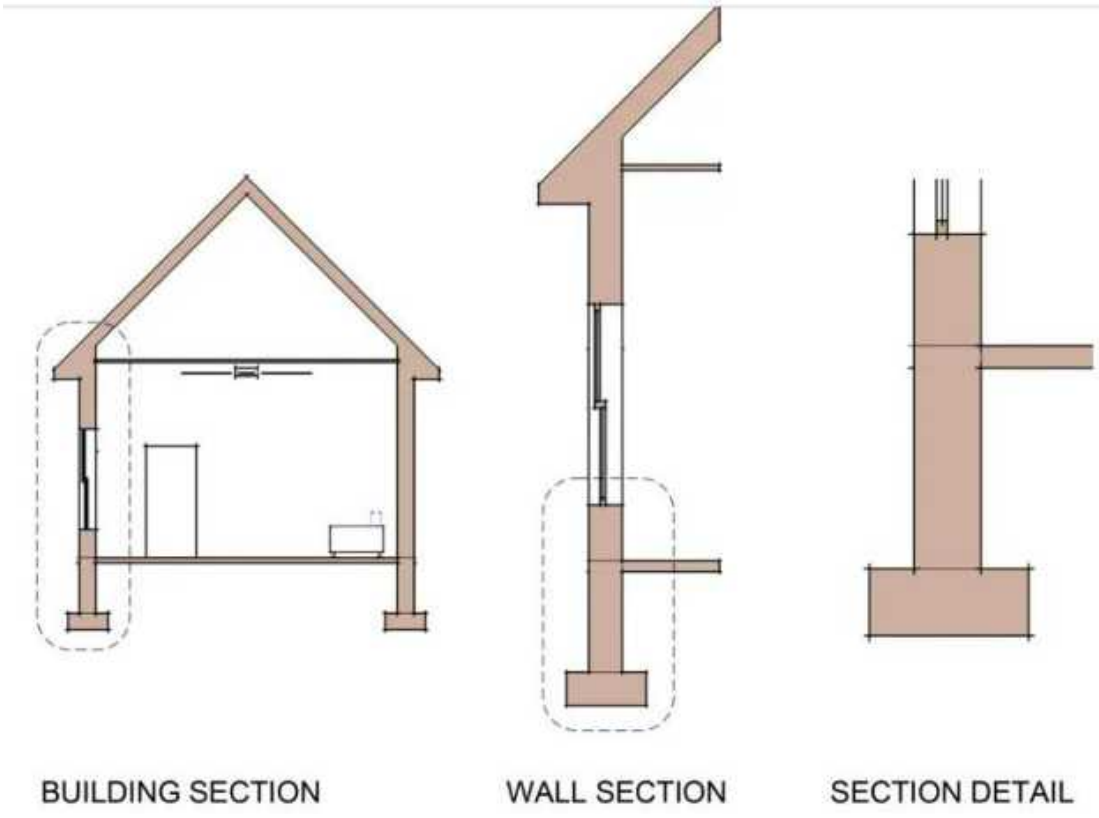




The direction of the plane through which the section is cut is often represented on plan drawings by a line of long and short dashes, called a section plane. If there are a number of sections, the line may have letters at each end indicating the name of the section drawing and an arrow showing the direction that the view takes.

Types of architectural section drawings

There are a few different types of section drawings that are used in a construction drawing set. Each serves a specific role and is meant to indicate specific information. There is a sort of hierarchy to section drawings – each section serves as a key for the section with the next level of detail. Below, the types of sections are described from the smallest scale (showing the largest portion of a building) to the largest scale (showing the most detail).



Building Sections

Building sections are created by slicing through the entire building from exterior wall to exterior wall. They are generally the scale of the exterior elevations
There are two general types of building sections that are described below.

Cross Section (transverse section)

Cross-sections are building sections that slice a building in a shorter direction.

Longitudinal Section

Longitudinal sections are building sections that slice a building in the longest direction.

Wall Sections

Wall sections are vertical slices that focus on the construction of a specific wall, typically at the exterior. These are larger in scale than building sections, so more detail can be seen

Detail Sections

Detail sections (typically referred to as just “details”) are an even larger scale drawing that hones in on one specific condition. They are typically drawn at scales between 1″=1′-0″ to 3″-1′-0″.

Plan details

Plan details are similar to section details but drawn in plan, meaning the section cut is taken horizontally instead of vertically.

Section Perspective

Perspective sections include 3D projection of the spaces beyond the section plane and can be used to give a graphical illustration of the relationship between spaces and building components as well as their depths that can be very helpful in trying to interpret a complex design.

Thus SECTION

represents a vertical plane cut through the object, in the same way as a floor plan is a horizontal section viewed from the top.

In the section view, everything cut by the section plane is shown as a bold line, often with a solid fill to show objects that are cut through, and anything seen beyond generally shown in a thinner line.

Sections are used to describe the relationship between different levels of a building.

A sectional elevation is a combination of a cross section, with elevations of other parts of the building seen beyond the section plane.

Geometrically, a cross section is a horizontal orthographic projection of a building on to a vertical plane, with the vertical plane cutting through the building

ELEVATIONS

What are elevation drawings?

In the construction industry, the term ‘elevation’ refers to an orthographic projection of the exterior (or sometimes the interior) faces of a building, that is, a two-dimensional drawing of the building’s façades. An elevation drawing is a first angle projection that shows all parts of the building as seen from a particular direction with the perspective flattened. Generally, elevations are produced for four directional views, for example, north, south, east, west.

What should elevation drawings include?

- The outline of a building.
- The exterior walls, and sometimes the finishes of the walls.
- Openings such as doors and windows.
- Roofing.
- Exterior features such as chimneys, decks, porches and steps.
- Any portion of the foundation that may be visible.
- Projections such as eves and rainwater pipes.
- Level datums such as finished ground level and floor positions.
- Key dimensions such as wall lengths and heights.
- A title block, including the name, number and revision of the drawing, the date of preparation, who the drawing was prepared by, project details, drawing scale, north point and so on.

What are elevations used for?

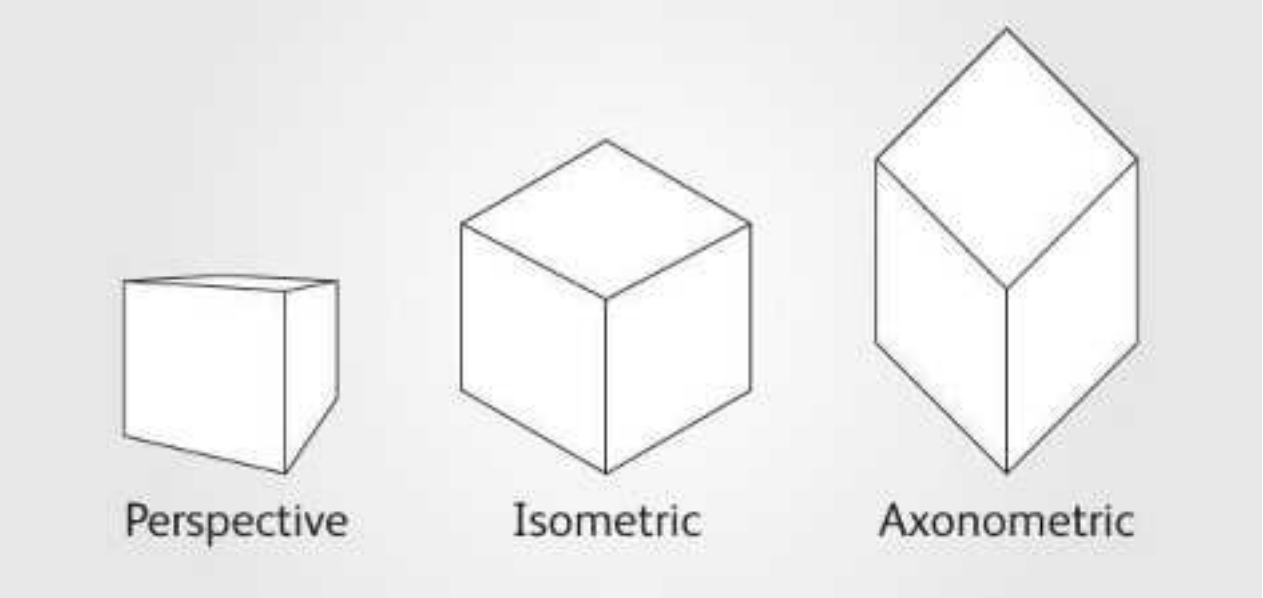
Elevations might be prepared for a number of reasons, including:

- To explore and communicate interior and exterior design options.
- As part of a survey of existing buildings.
- To create a record of an existing building.
- As part of an application for planning permission.
- As part of an application for building regulations approval.
- To communicate construction information.
- For sales and marketing.

Thus ELEVATION

- An elevation is a view of a building seen from one side, a flat representation of one façade. This is the most common view used to describe the external appearance of a building.
- Geometrically, an elevation is a horizontal orthographic projection a building on to a vertical plane, the vertical plane normally being parallel to one side of the building.

SINGLE-VIEW DRAWINGS



Single-view drawings attempt to picture an object or space as we normally see it in reality with all three dimensions appearing simultaneously. They present relationships of objects, space, and materials in a realistic or photographic-looking manner. Singleview drawings can be either paraline or perspective views. In paraline drawings, lines are drawn parallel to one another, and object features retain this relationship as they appear to recede in the distance .This parallel phenomenon is what gives this drawing system the name paraline. The perspective view produces a more realistic picture, as it attempts to duplicate the way our eyes actually see objects and space. In perspective drawing, parallel lines in space or on an object appear to converge to a common distant vanishing point. Perspective drawings resemble a photograph and are the most convincing of the drawing systems. They generally take more time to produce by hand, but computer generation has made the process less time-consuming.

PARALINE DRAWINGS

Paralines are usually faster and easier to develop than perspectives, as receding horizontal lines can be drawn with instruments, without calculating depths or drawing lines to a common vanishing point as is necessary in perspective drawings. Paraline drawings are categorized according to the projection method used to develop them, and **can be subdivided into two distinct types, axonometric and oblique .**

AXONOMETRIC PROJECTIONS

Axonometric projection creates a true plan set at 45º, which retains the original orthogonal geometry of the plan. Axonometric drawings are technically just one form of paraline drawing. Axonometric means “measurable along the axes.” Axonometric drawings include three axes that relate to width, depth, and height. Each line drawn parallel to these axes is drawn at an exact scale with the true length of the object depicted. The axonometric projection system consists of three primary views: isometric, dimetric, and trimetric. These views are distinguished by the degree of variation visible of the principal faces of the object. In the isometric view, all faces represent true scales. The latter two systems show one or more faces in a reduced scale.

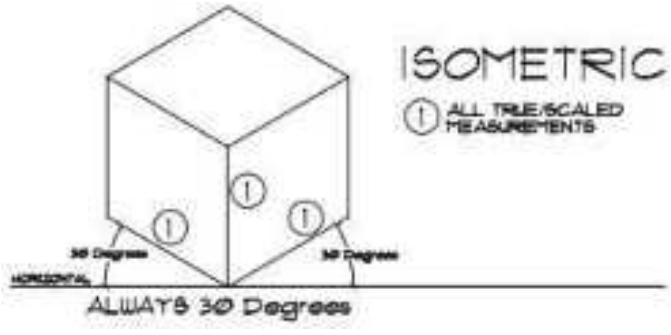
Thus Axonometric projection creates a true plan set at 45º, which retains the original orthogonal geometry of the plan. It is particularly suitable for representing interior designs, such as kitchen layouts. Planning drawings can also be effective represented as axonometric projections, showing the relationships between buildings and topography.

ISOMETRIC

Isometric (derived from the Greek words meaning “equal measure”) drawings present the three primary faces of an object equally and at the same angle with the viewing plane. The planes of width and depth are drawn at 30 degrees and the height is held vertical .Dimensions are scaled equally along all three axes. Isometric drawings are the easiest of the axonometric systems to construct, but the visual distortion caused by parallel lines not appearing to converge to a distant vanishing point gives them a distinctly pictorial effect.

Thus Isometric projection

Unlike the axonometric projection, the isometric plan view is slightly distorted, using a plan grid at 30º from the horizontal in both directions. It can be used to show the nature of the design and explain construction details more clearly than an orthographic projection. It is sometimes used during concept design to help the client grasp the mass of the proposal.



Prepared by
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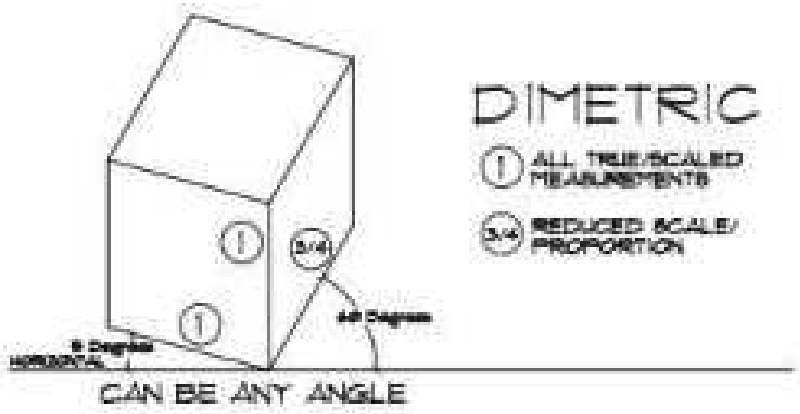
Associate professor

DIMETRIC AND TRIMETRIC DRAWINGS

In dimetric and trimetric drawings, all principal faces are not held at equal angles to the picture plane .

The dimetric drawing makes two faces equally visible and shortens the third face. The trimetric rotates an object so that all three faces are at different angles to the picture plane. In both dimetric and trimetric drawings, the scale along one or more of the principal faces is reduced proportionately to emphasize or deemphasize a feature of the object. Both dimetric and trimetric drawings are more time-consuming to construct than isometric drawings, but have the advantage of presenting an object's best features and more closely resembling perspective drawings.



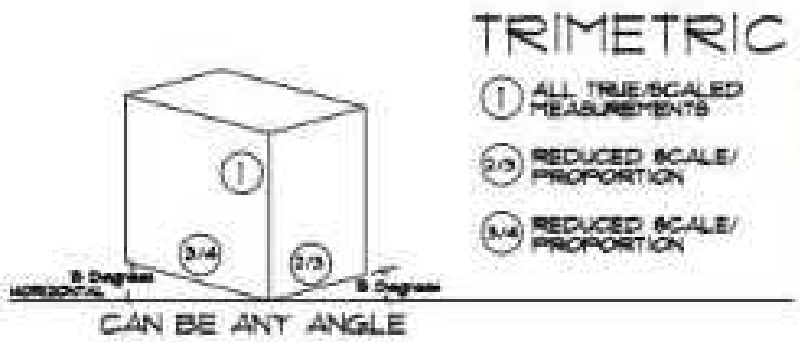
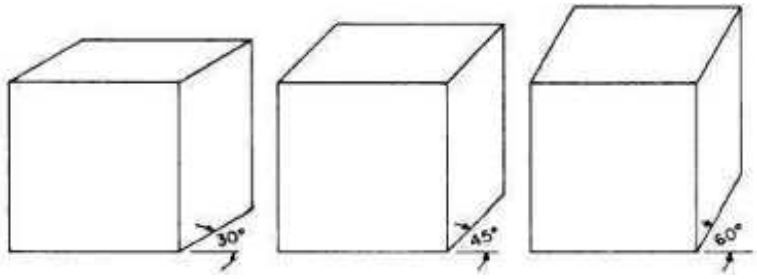


Figure 4-11 In dimetric and trimetric drawings, all principal faces of an object are not held at equal angles to the picture plane.

OBLIQUE PROJECTIONS

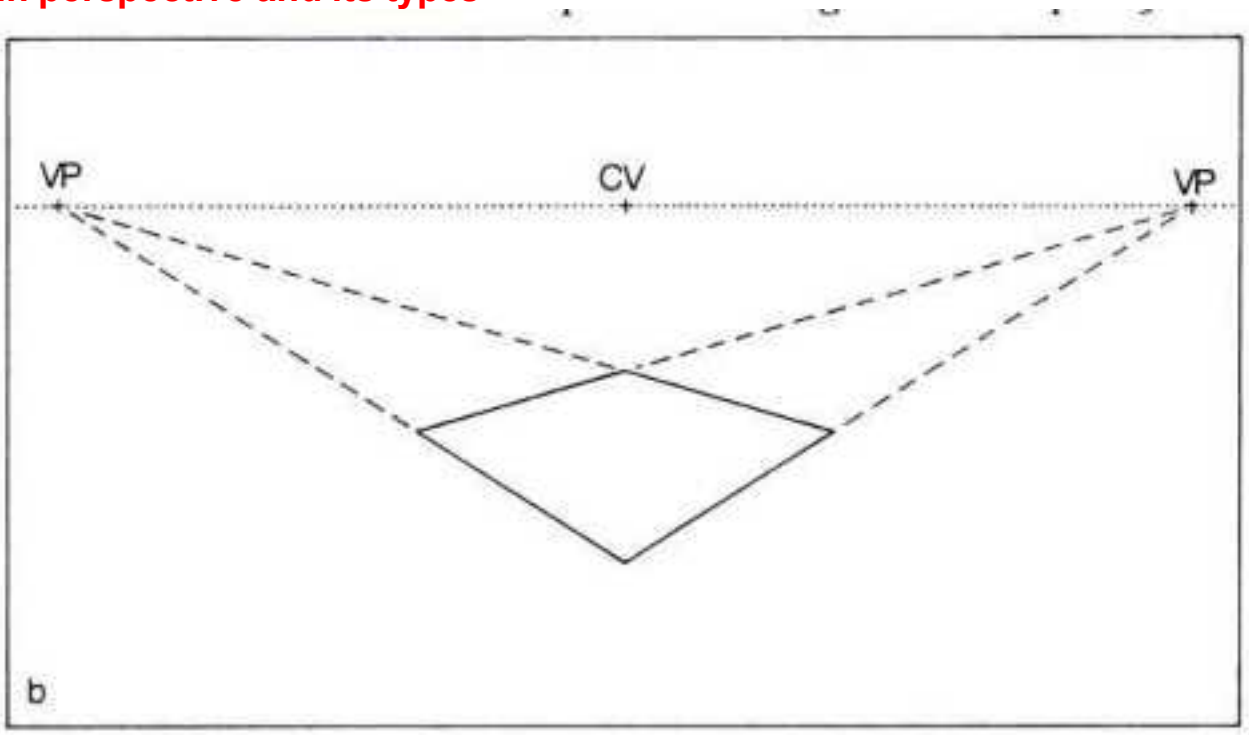


When primary information is drawn in elevation, the interpretation can be enhanced by an oblique projection. This is a simple method of producing two-

dimensional images of three-dimensional objects. The differentiating characteristic of oblique projection is that the drawn objects are not in perspective, and so do not correspond to any actual obtainable view.

Oblique projections are popular among interior designers. Although there are several types of oblique drawings, the plan oblique and elevation oblique are the most commonly used. In these drawings, the floor plan or elevation serves as the true face on the picture plane, and parallel lines are projected vertically or horizontally at an angle other than 90 degrees from this face. The viewer's lines of sight are parallel, but are not at right angles with the viewing plane .Oblique drawings also have the feature that one face of an object is always parallel to the viewing plane and represented in true proportion, such as an elevation or plan view. The parallel lines are sometimes reduced in scale (short ened) from true size to reduce the visual distortion. To produce a plan oblique, the true shaped plan can be rotated to any angle, although the 30/60-degree and 45/45-degree are the most popular. The advantage of the plan oblique is that the building's floor plan can be used directly to generate this kind of drawing. By contrast, isometrics are more time-consuming because of the extra projections and dimensioning required. A floor plan or elevation cannot be used directly to produce an isometric drawing.

Explain perspective and its types



PERSPECTIVE DRAWINGS

A perspective drawings is a type of single-view drawing that is more realistic-looking than an oblique or axonometric drawing. In a perspective drawing, objects appear to

diminish in size as they recede into the distance, and lines that are parallel in the actual object appear to converge at some distant point on the horizon (termed the vanishing point). Perspectives are used primarily as presentation drawings to portray a finished object, building, or interior space .Perspectives most closely duplicate what our eye or a camera sees. Perspectives have characteristics that distinguish them from paraline and orthographic drawings.
These characteristics are:
• Convergence of parallel lines
• Diminution of size
• Foreshortening
• Overlapping of forms
These properties help make perspectives very realistic compared to the other types of drawings. Perspective drawings are broken into three basic categories according to the number of vanishing points used to construct them.

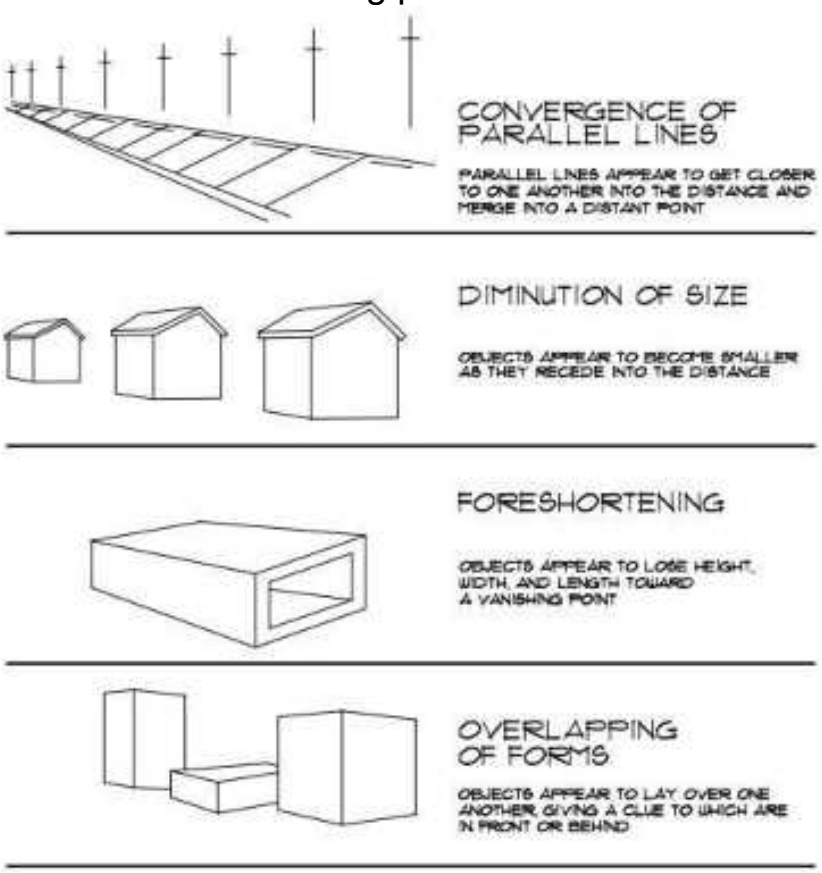


Figure 4-14 Perspective drawing use four properties that make th more realistic than paraline and orthographic drawings.

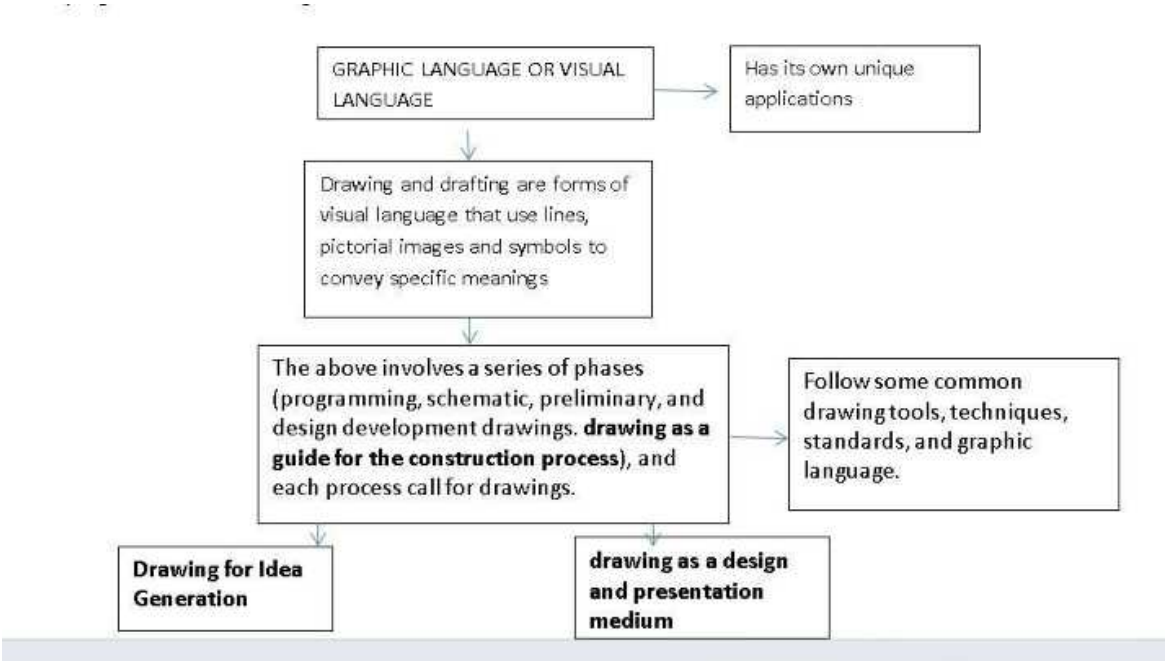
To construct perspectives, an imaginary picture plane is placed between the observer and the object (or interior) to be drawn.
VANISHING POINT:
A vanishing point is a point on the image plane of a perspective drawing where the two-dimensional perspective projections (or drawings) of mutually parallel lines in three-dimensional space appear to converge
Vanishing points (VPs): The imaginary point(s) in an image where parallel lines appear to converge in as they go further away from the observer, are known as vanishing points. It coincides with the eye level of the observer

HORIZON LINE:
The imaginary horizontal line passing through the VP where the sky appears to meet the ground is called as horizon line.
STATION POINT (SPS):
The position of the observer in plan with respect to dimension of a structure is known as the station point (SP)

EYE LEVEL PLANE:
The imaginary horizontal plane passing through the observer's eye and the horizon line and parallel to the ground level plane is known as eye level plane.
CENTRAL VISUAL PLANE:
The imaginary vertical plane passing through the observer's eye and perpendicular to the eye level plane and ground level plane is known as central visual plane
PICTURE PLANE (PP):
The imaginary plane cutting through both the eye level plane and central visual plane in a mutual perpendicular fashion, is known as the picture plane (PP). It can be imagined as a transparent plane cutting through the path of the visual rays. It forms the focal plane onto which all the information is projected.
ONE-POINT PERSPECTIVE
If this plane can be placed parallel to one plane of an object, parallel lines will appear to converge to only one point, producing the one-point perspective.
TWO-POINT PERSPECTIVE
If the picture plane is placed parallel to only one set of lines (the vertical lines, for example), the results are termed a two-point perspective .The parallel lines then appear to converge to two vanishing points.
THREE-POINT PERSPECTIVE
A three-point perspective is produced when all the lines or faces of an object are oblique (not parallel) to the picture plane. This method is not often used for interior spaces, but rather for tall buildings.

GRAPHIC LANGUAGE AS A COMMUNICATION TOOL IN DESIGN AND ARCHITECTURE

Ideas and plans are formed in the designer's mind, but to be transformed into reality, they have to be communicated to others
Professionals in the building industry use drawings as the primary means of developing and sharing their ideas. . In the design field, drawing, also called sketching or idea generation, is used as a technique for developing and communicating ideas

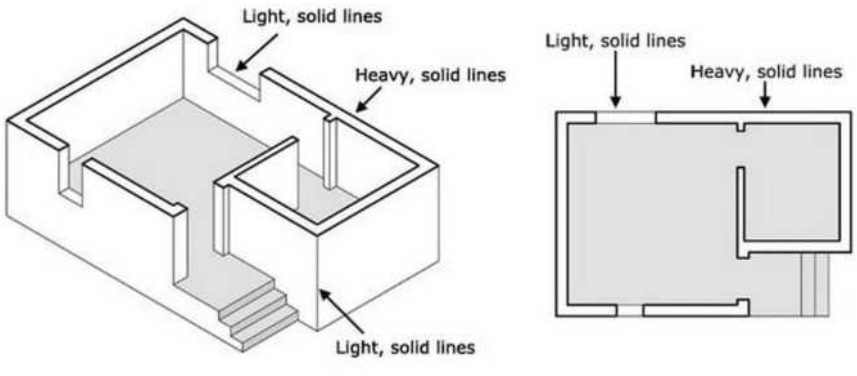


the different aspects to consider during the drawing of historic buildings and contemporary buildings

Great drawings tell a story. They invite us to question how and why we read them as built spaces, and what we imagine between the lines. They are architecture in their own right. When creating the perfect drawing, whether a plan, sketch or projection, there are a series of moves to keep in mind that can help illustrate story. The following are the different aspects to consider during the drawing of historic buildings and contemporary buildings

Use Diverse Line Styles & Line Weights

Lines are the most expressive aspect of an architectural drawing. They are used to define, outline, describe, and capture attention. But if every line looks the same, the legibility and perception of the drawing will get compromised. To tackle this a distinct variety of line styles and line weights to distinguish depth and emphasize critical parts of the drawing.



For instance, thick bold lines can help identify the sectional walls in a drawing, while the thinner lines can represent window glazing. Additionally, dashed lines can be used to depict hidden or invisible components such as beams.

Line weights

Manual drafting techniques typically involve drawing different line weights to represent different items. Different line weights can be created by using a different size mechanical pencil lead, or a different size of technical drawing pen.

Exterior walls are typically drawn on floor plans and sections with heavy, solid lines. Windows may be drawn lighter, or with the same heaviness but in a dash-dot-dash format. Interior walls have slightly lighter line weights. Elements such as fittings should be drawn with the lightest line weight, and sometimes dashed lines.

Lettering

It is important to maintain correct lettering sizes in manual draft, for example:

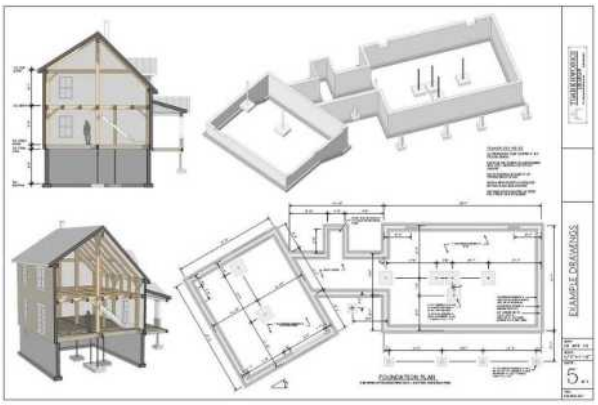
- Notes: 3/32 inch letters.
- Special notes: 1/8 inch letters.
- Titles: 1/4 inch letters.

draw light guidelines first to ensure the correct and uniform text height.

Scale

The use of different scales enables objects and spaces to be depicted at a specific ratio to their actual size, helping to maintain consistency. Suitable scales will vary depending on the size of object, size of paper and level of information that needs to be conveyed,

Determine the Scale of the Drawing
One of the preeminent considerations while designing a building is how it will translate in the real world. This is where determining the right scale of the drawing factors. A scaled drawing assigns each object the same scale in proportion to reality helping one understand how each element would appear.



General contractors, electricians, plumbers, building inspectors, all use architectural drawings as an instructional and visual guide. Hence, it is important to ensure the drawings abide by the conventional drafting scales. Additionally, the scale must be mentioned on the drawing and should be selected such that the drawing neatly fits on the sheet.

Projections

There are a number of techniques of projection that can be used to represent three-dimensional objects in two-dimensions by 'projecting' their image onto a planar surface.

Notation and units

Standard notation conventions should be followed so that there is
clear communication between different people and mistakes are avoided.

Symbols

A range of standard symbols and hatching techniques can be used to convey recognised meaning without the need for explanation.

Apply Apt Textures, Hatches & Colors

The texture is the essence of an architectural drawing. It adds depth to any object and gives life to the drawing. Ordinarily used to represent a material’s quality, textures can be added to any surface permitting them to appear soft or hard, near or far.
It is important to employ the right texture, hatch, or solid color with appropriate opacity to convey the movement or pattern in the drawing. For example, a wall can be defined by a different texture than the flooring and the contrast helps make every element legible. When used innovatively, textures can be the fundamental source of telling a story in the drawing.

Harness color

Color can bring a drawing to life. There are three basic categories of colorization: black and white drawings, drawings with a few colors, or an entire color presentation or rendering. In a black and white or Greyscale presentation, only show lines with various thickness, in addition to shade and shadow. In choosing only a few colors, can focus on the lines or individual elements.

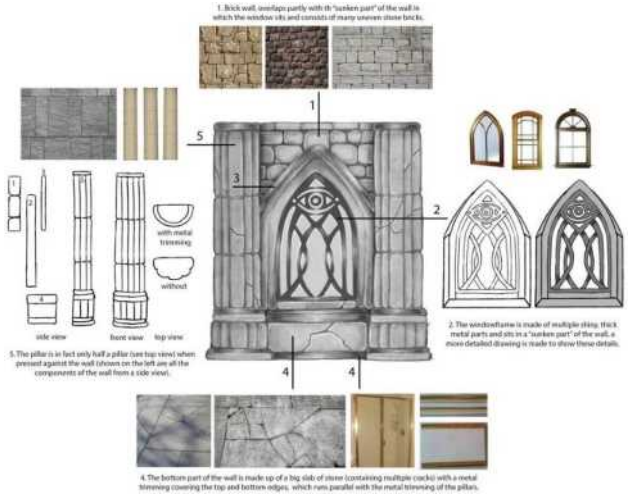
For example, it may be a greyscale presentation with bright red highlights or section plane cuts. This is used to contrast with a generally achromatic presentation. In a full color presentation, can render out a drawing using watercolor, markers, brush pens, or pastels. It's important to remember that color should be used intentionally, whether as render or accent, to clarify an idea or bring awareness to an element of a design.

Take Care of the Details

"God is in the details."- Ludwig Mies Van Der Rohe

Details are usually the most significant aspect in explaining the textures, light, and scale of the drawing. They can represent the accessorization of a drawing such as clear dimensions, right text size, and font, annotations, decorative elements like furniture, landscape, etc. They can also mean the literal details of a building or the way the drawing is executed at multiple scales. A larger-scale representation of some parts of the drawings, known as detailed drawings, enables a clear understanding of complex construction or design.

Delicate detailing is the cornerstone of any architectural drawing and can help draw attention to various critical features of the design. It helps people perceive three-dimensional ideas through two-dimensional representations with absolute simplicity and comprehension.



See the light

One of the most effective methods of making your drawings appear three dimensional is to consider how light works. A careful handling of light, shadow and tone can help give definition to form. Whether you have a single light source or many, a drawing and sketch can be quickly brought to life by understanding how light shapes a building or composition.

The shadows within a perspective or elevation view should always be drawn in direct response to the forms that the light hits, the angle from which the light is coming from and the intensity of the light source. For objects and buildings, you have a light side, a shadow side and a cast shadow of a form. As you draw, consider how light affects the subject you're drawing and the character of the shadows that are generated.

Take a new perspective

Perspective in drawing is a representation of an image as it would be perceived by the eye. Perspective is the view from a particular fixed viewpoint, and horizontal and vertical edges in the object are represented by horizontals and verticals in the drawing. Lines leading away into the distance appear to converge at a vanishing point.

It's important to understand the role of perspective and how it gives dimension to our drawings. The normal convention in architectural drawing is to use two-point perspective, with all the verticals drawn as verticals on the page. Different perspectives give us new ways to look at a particular building, scene, surface or field condition.

Embrace new technologies

The digital turn in architecture has already gone through several stages and phases: folding, nonlinearity and hypersurfaces, to versioning, scripting, information modelling and Parametricism. Today, programs like Grasshopper to generate wildly complex and detailed drawings that create new ways to tell a visual story.

.**Employ a visual hierarchy**

Visual hierarchy refers to prioritizing an element or series of elements in drawing. This method is used over a field condition where no greater weight is given to

individual elements. Visual hierarchy allows to focus on certain aspects of the drawing and its composition.
Visual hierarchy is also tied to layering, where overdraw or crate multiple layers of drawings on top of one another to create depth. Layering can also relate to color, line work or about opacity. For example, a black and white section drawing can use color on the plane of the section cut to highlight which parts of a building are being cut through.

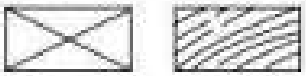
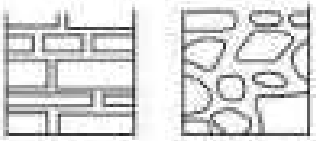
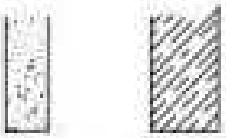
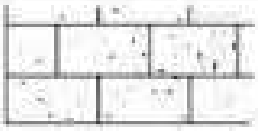
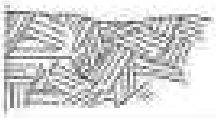
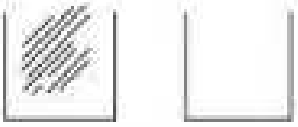
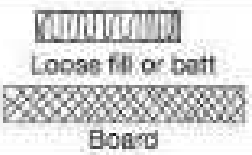
Architectural Drawings

Design drawings enable the professional designer to visualize and communicate the features of a three-dimensional object or interior space. Then, detailed construction drawings are made to accurately describe what materials are to be used and how the object or space is to be constructed. The design drawing can be a three-dimensional pictorial sketch that shows what the object looks like in reality or a series of related yet different views of the object, such as a plan or top view and an elevation. The first approach, the single view, attempts to portray the object as the eye would see it. The second approach, the multiview, relies on the eye to view a series of images and the mind to then put these views together into a whole. For example, a floor plan shows width and length of objects within a space. An elevation view is then drawn to illustrate height, but no third dimension or true depth is visually indicated. Many computer software programs now can produce some very convincing single-view drawings from multiviews, then allow designers to quickly flip back and forth between these two types of drawings.

Create A Sheet Layout

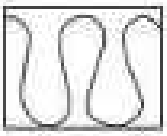
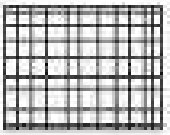
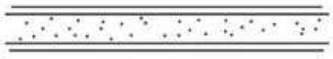
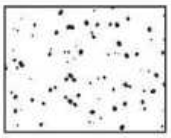
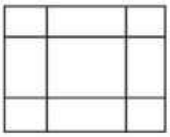
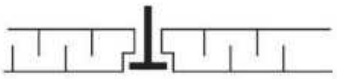
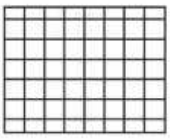
Oftentimes, the drawings are drawn with great legibility and appropriate accuracy, but the ultimate product is not up to the mark. The composition of the numerous elements of the drawing in the final sheet is just as important as the individual drawings themselves. This is where a sheet layout comes in handy.
The success of a layout depends on the arrangement of the various components in a visual hierarchy enhancing the appearance of the particular object and the objects as a whole piece of design. The layout is extremely necessary to make the drawing functional and look attractive to the user. The correct usage of balance, proportion, sequence, emphasis, and unity of all the cohesive elements is essential to a proper layout.

MATERIAL REPRESENTATION IN SECTION and PLAN

MATERIAL INDICATION SYMBOLS			
Material	**Plan**	**Elevation**	**Section**
Wood	Floor areas left blank		
Brick			Same as plan view
Stone			
Concrete			Same as plan view
Concrete block			Same as plan view
Earth	None	None	
Glass			
Insulation	Same as section		

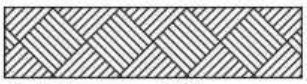
MATERIAL INDICATION SYMBOLS *(cont.)*			
Material	**Plan**	**Elevation**	**Section**
Plaster	Same as section	Plaster	Stud Lath and plaster
Structural steel		Indicate by note	
Sheet metal flashing	Indicate by note		Show contour
Tile	Floor	Wall	
Porous fill	None	None	
Plywood	Indicated by note	Indicated by note	

9-17

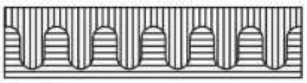
MATERIAL INDICATION SYMBOLS *(cont.)*			
Material	**Plan**	**Elevation**	**Section**
Batt insulation		None	Same as plan
Rigid insulation		None	Same as plan
Glass			
Gypsum wallboard			Same as plan
Acoustical		None	
Ceramic wall tile			Same as plan
Floor tile		None	

MATERIALS SYMBOLS

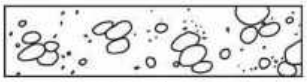
Earthworks

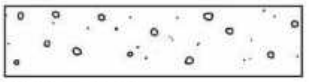

Earth/compact fill


Porous fill/gravel


Rock

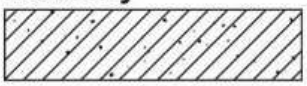
Concrete

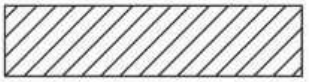

Cast-in-place/precast

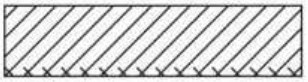

Lightweight

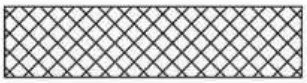

Sand/mortar/
plaster/cut stone

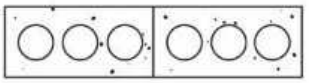
Masonry

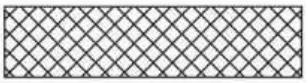

Adobe/rammed earth


Common/face

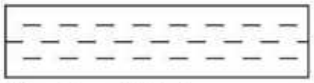

Fire brick

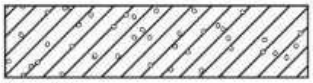

Concrete block


Gypsum block


Structural facing tile

Stone


Bluestone/slate/
soapstone/flagging


Rubble


Marble

Metal

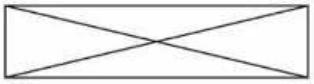

Aluminum


Brass/bronze


Steel/other metals

Wood


Finish


Rough


Blocking


Hardboard

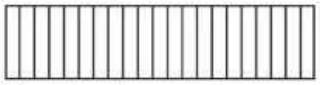

Plywood – large scale

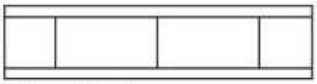

Plywood – small scale

MATERIALS SYMBOLS *(cont.)*

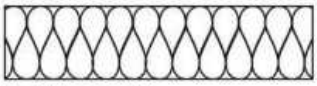
Glass

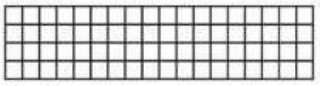

Glass


Structural


Glass block

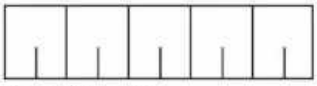
Insulation

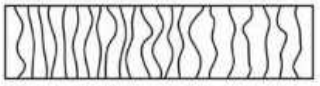

Batt/loose fill

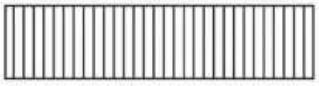

Rigid

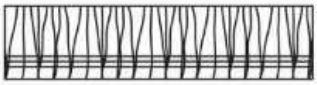

Spray/foam

Finishes

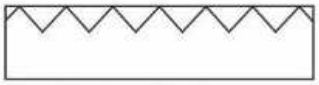

Acoustical tile


Ceramic tile – large scale


Ceramic tile – small scale


Carpet and pad

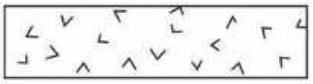

Gypsum wallboard


Metal lath and plaster

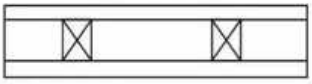
Finishes *(cont.)*

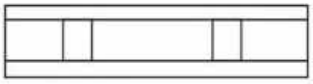

Plastic


Resilient flooring/plastic laminate


Terrazzo

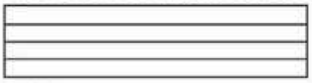
Plan and Section Indications
Partition Indications

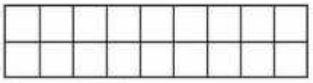

Wood stud

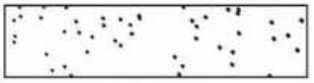

Metal stud


Special finish face

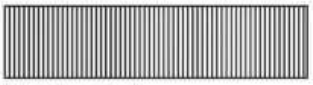
Elevation Indications


Brick

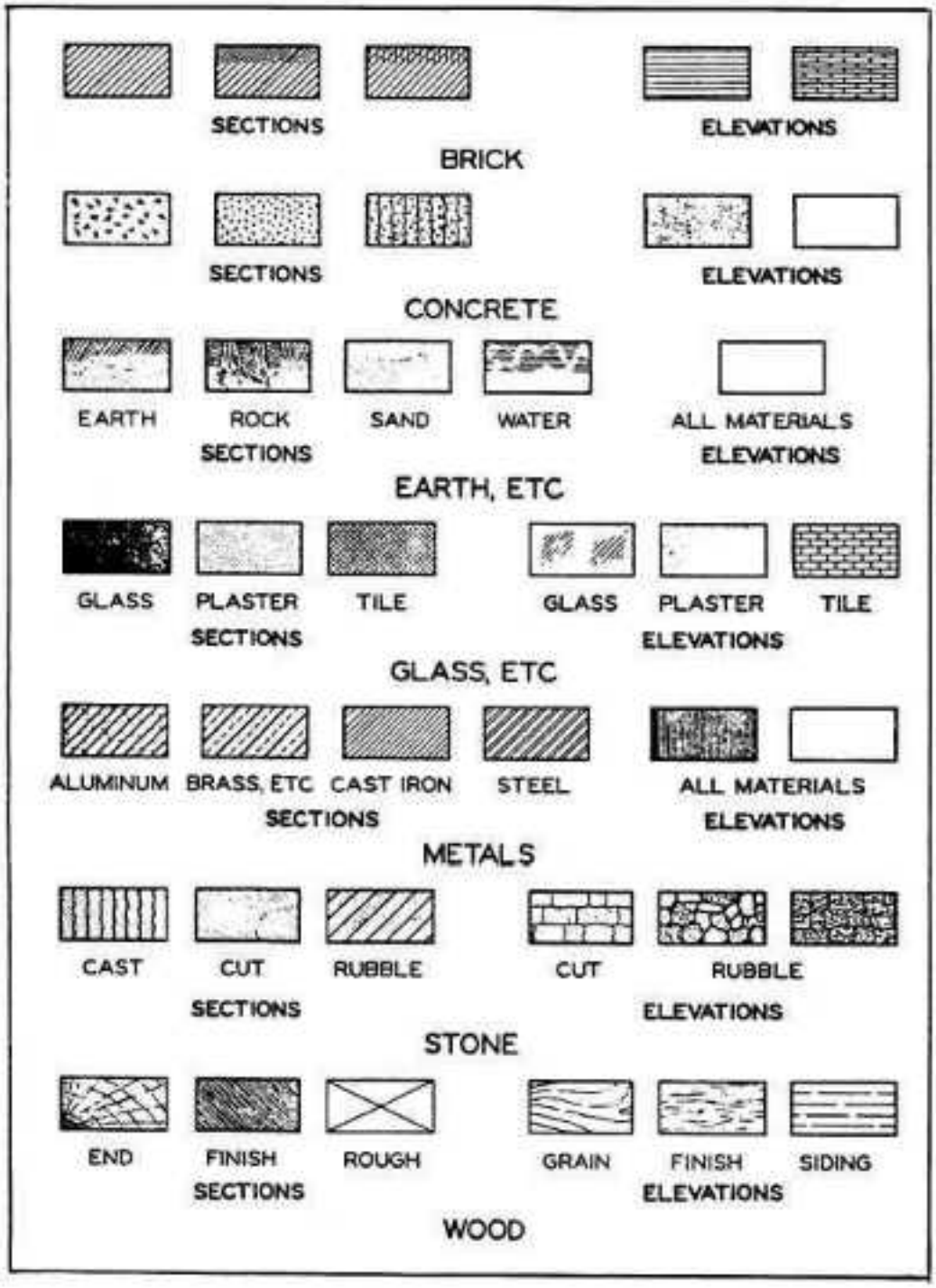

Ceramic tile

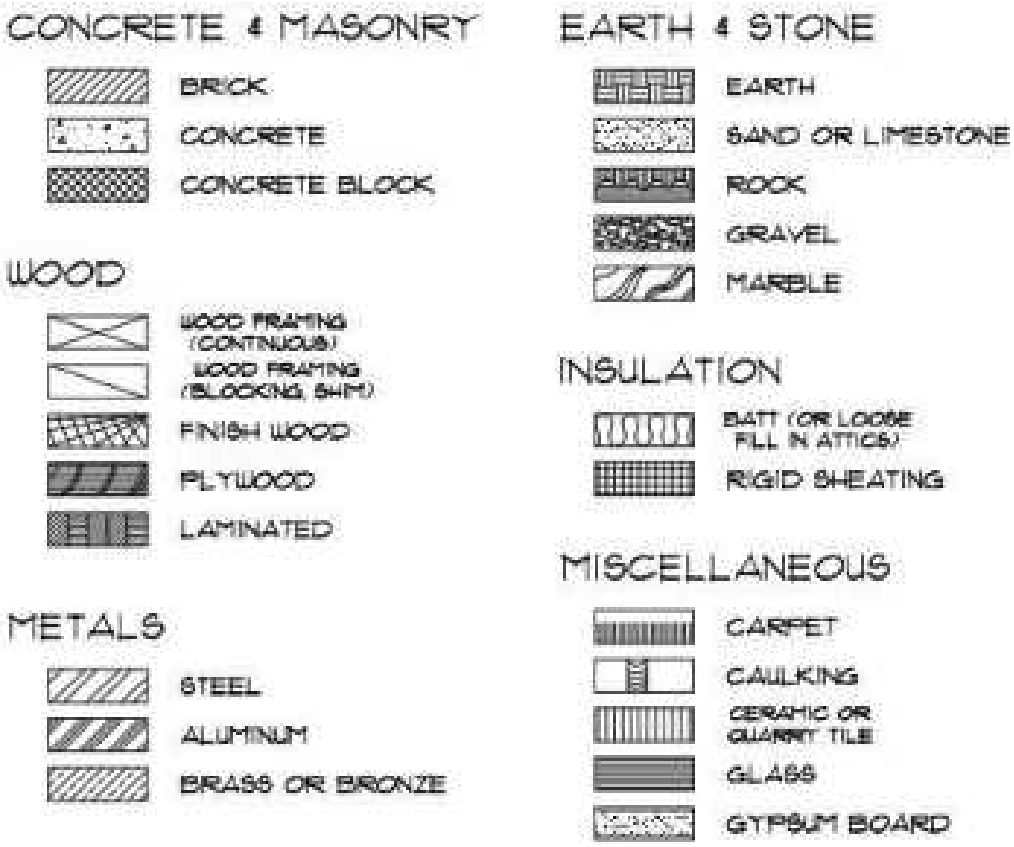

Concrete/plaster


Glass

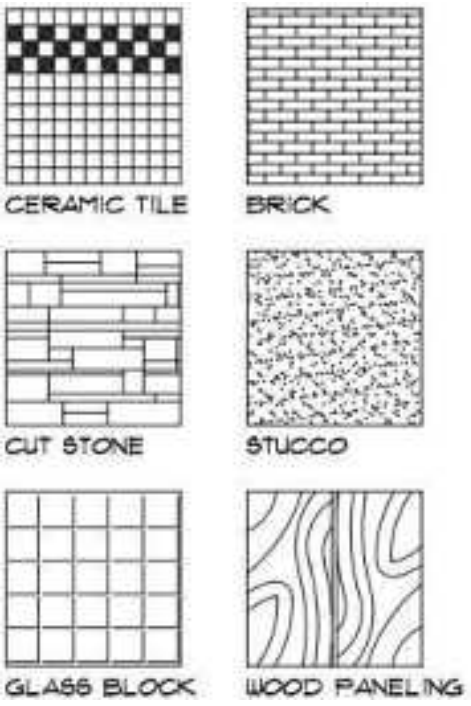

Sheet metal


Shingles/siding

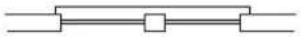
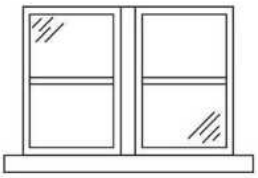
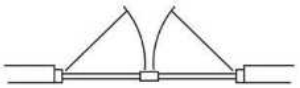
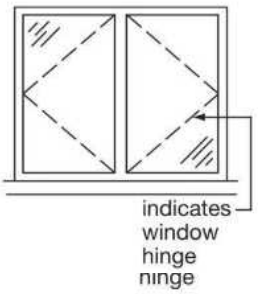
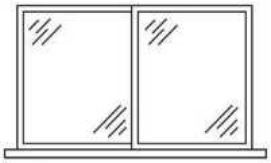
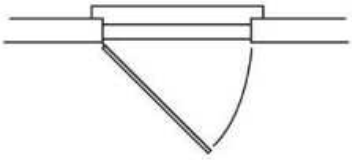
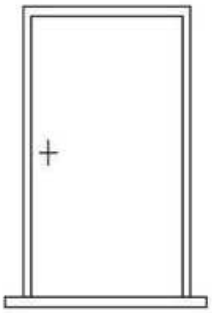
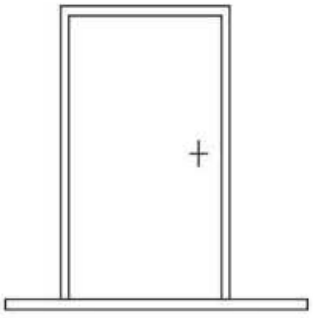

SECTIONS
ELEVATIONS
BRICK
SECTIONS
ELEVATIONS
CONCRETE
EARTH
ROCK
SAND
WATER
ALL MATERIALS
SECTIONS
ELEVATIONS
EARTH, ETC
GLASS
PLASTER
TILE
GLASS
PLASTER
TILE
SECTIONS
ELEVATIONS
GLASS, ETC
ALUMINUM
BRASS, ETC
CAST IRON
STEEL
ALL MATERIALS
SECTIONS
ELEVATIONS
METALS
CAST
CUT
RUBBLE
CUT
RUBBLE
SECTIONS
ELEVATIONS
STONE
END
FINISH
ROUGH
GRAIN
FINISH
SIDING
SECTIONS
ELEVATIONS
WOOD



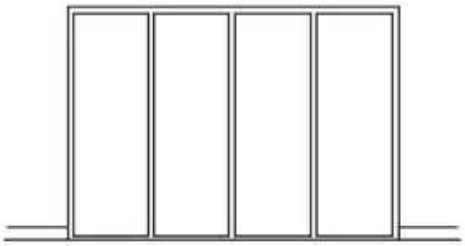
MATERIAL REPRESENTATION IN ELEVATION



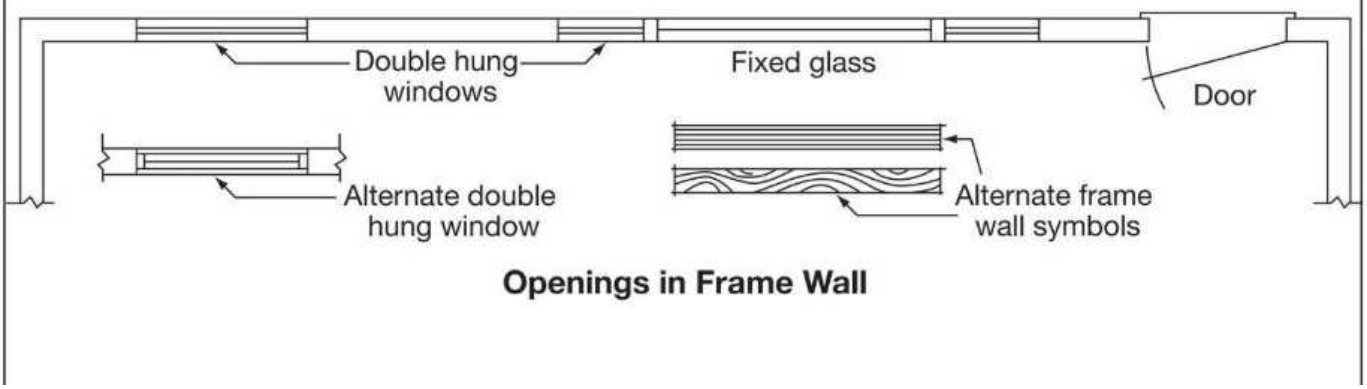
WINDOW AND DOOR SYMBOLS

Type	Plan	Elevation
Double hung windows		
Casement windows		
Slider		
Exterior door		
Interior door		

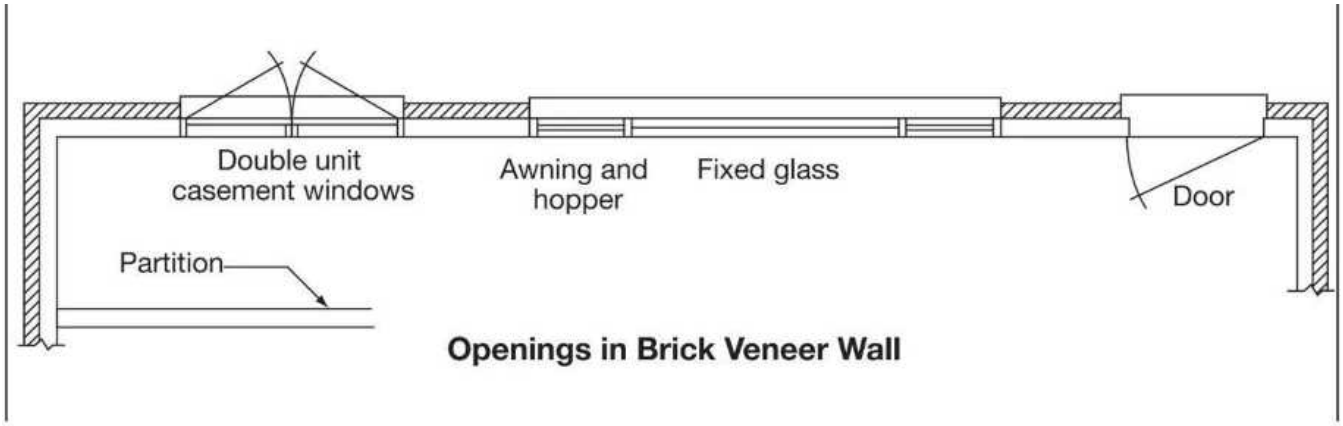
Bifold door



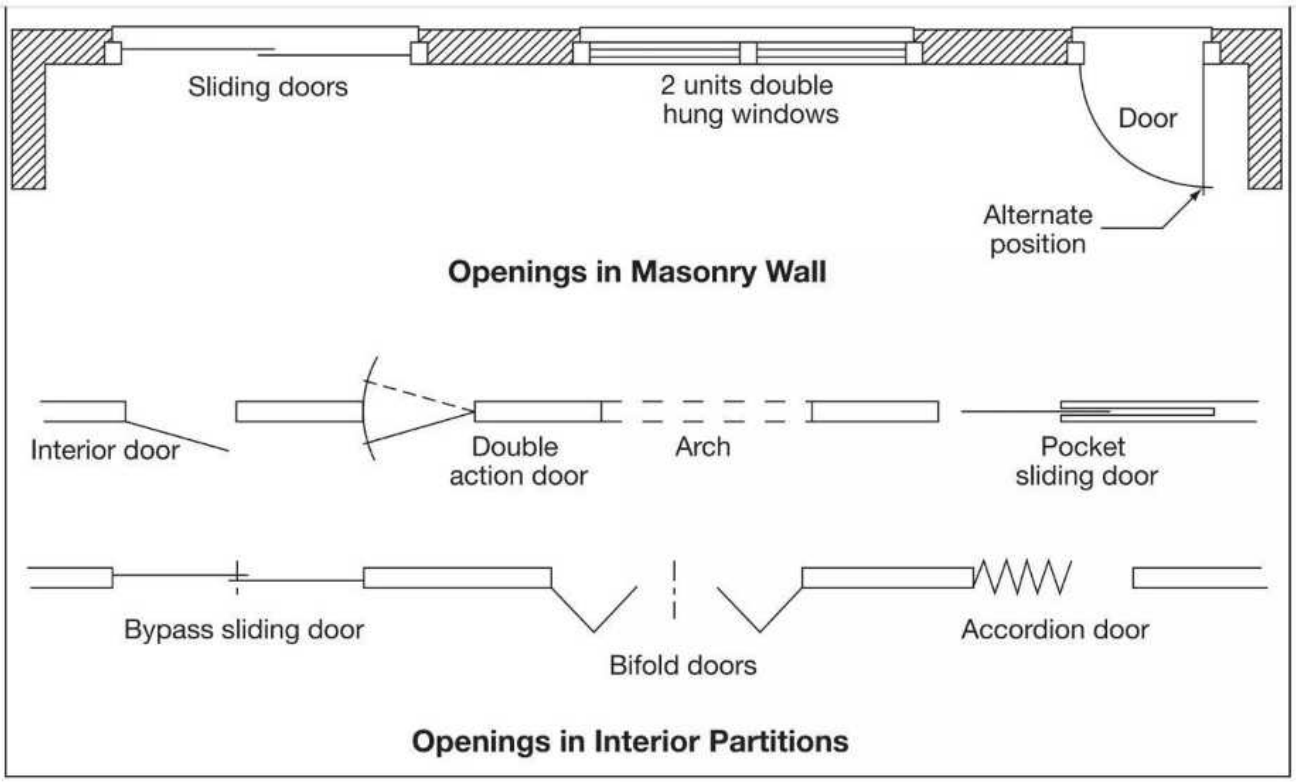
WINDOW AND DOOR SYMBOLS *(cont.)*



Openings in Frame Wall

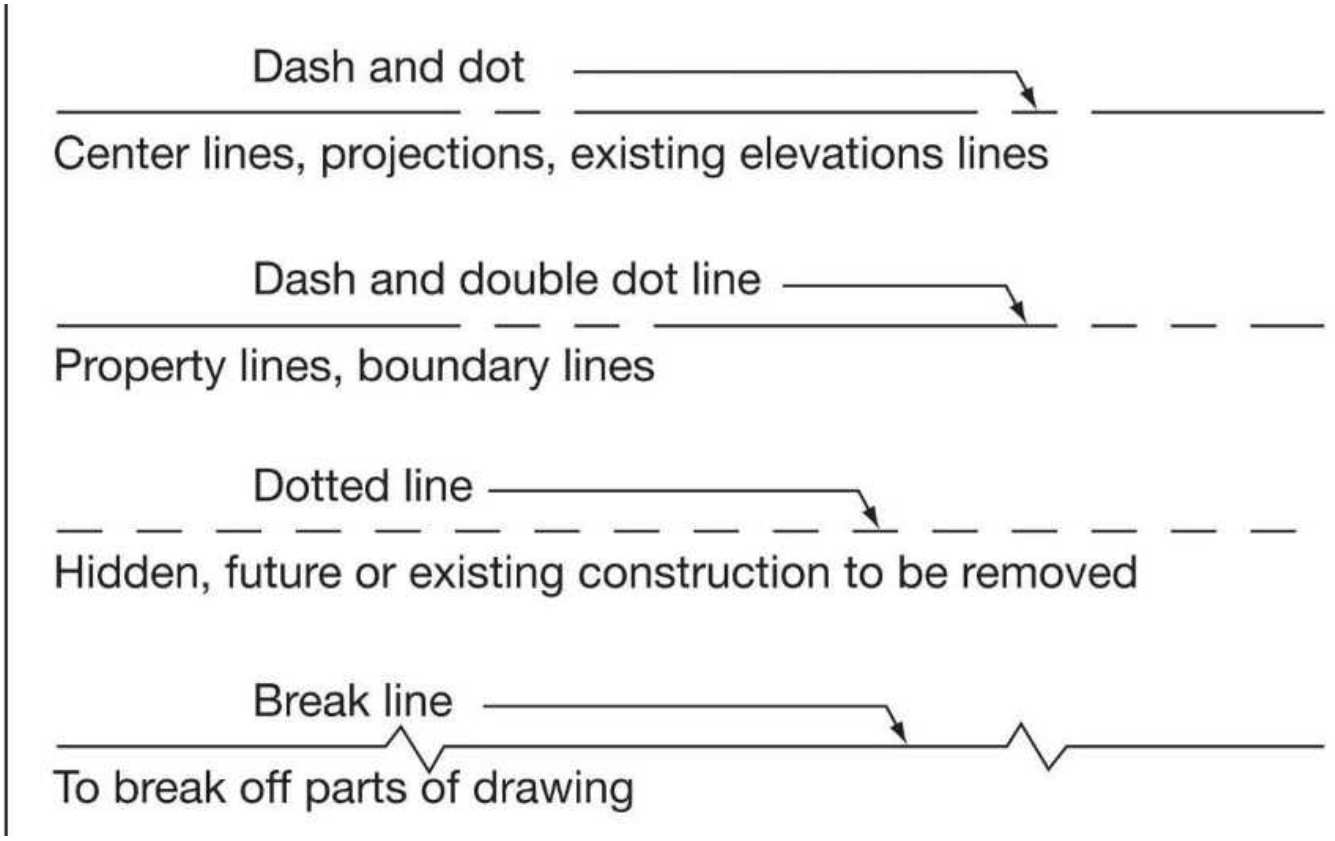


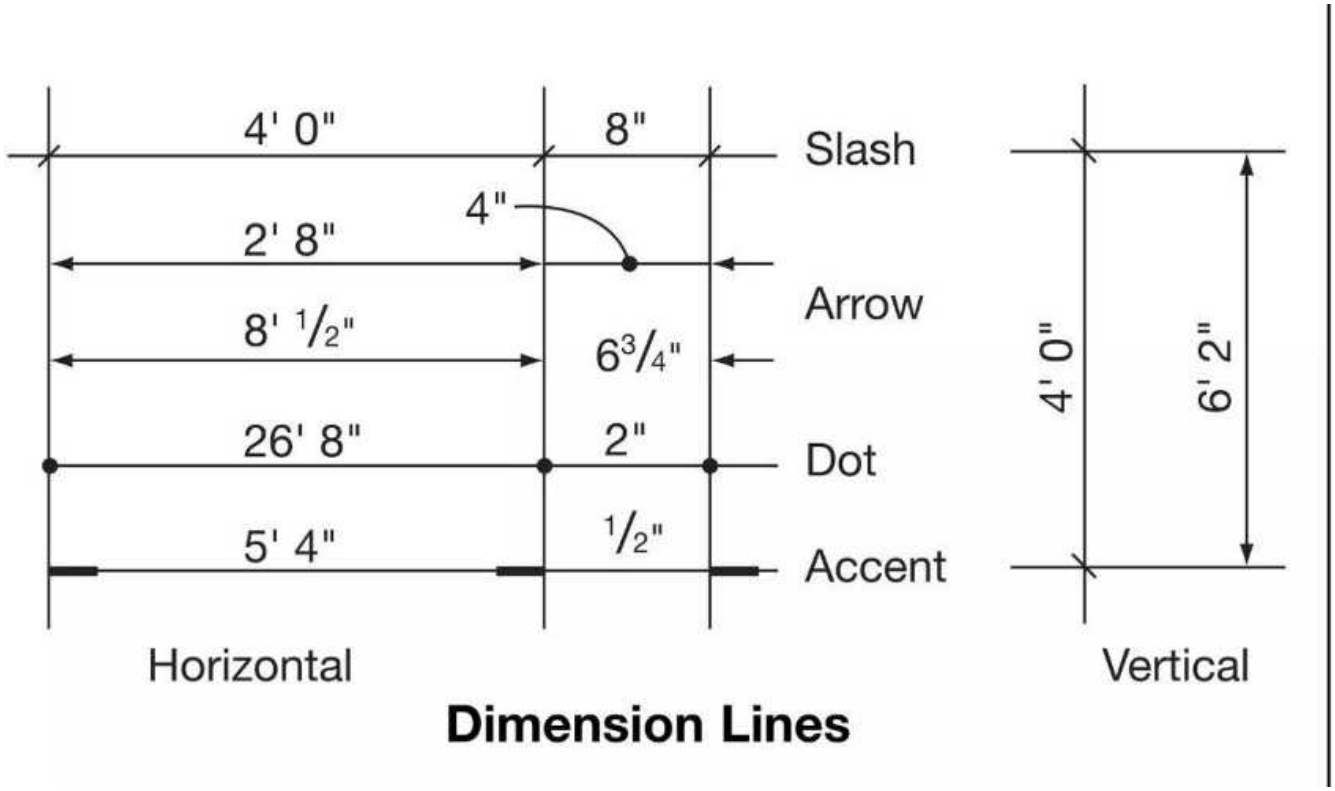
Openings in Brick Veneer Wall



Up 17R
$11\frac{1}{2}$ T → Stair direction symbol

North point
to be placed on each
floor plan, generally in
lower right hand corner
of drawings





Dimension Lines

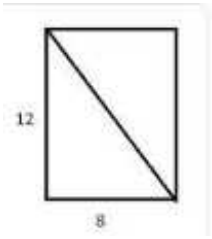
MEASURED DRAWING & IS IMPORTANCE

The value of *measured drawings* as educational tools to learn about the architectural context as well as signifiers of the cultural values have transcended the *importance* of these two-dimensional illustrations as ephemeral depictions of building forms and materials

The measured drawing is a snapshot of the architectural context at the time of documentation, meaning that architects record the dimensional, material, and structural details of the building and delineate these qualities “true to nature and to develop an understanding of the principles of building preservation

How to find the length of the diagonal of a rectangle

A diagonal of a rectangle cuts the rectangle into 2 right triangles with sides equal to the sides of the rectangle and with a hypotenuse that is the diagonal. All you need to do is use the pythagorean theorem: where a and b are the sides of the rectangle and c is the length of the diagonal.



STEPS TO CONSIDERED IN DOCUMENTATION OF HISTORIC AND CONTEMPORARY BUIDINGS

SEQUENCE OF MEASURED DRAWING IN DETAIL

INTRODUCTION

An architectural representation drawn to the scale of an existing building.

An architectural drawing of an existing building, object, site, or detail that is accurate drawn to scale on the basis of field measurements.

Methods of documentation and measured drawings aims to develop an understanding of the principles of building preservation and the method of recording it in **three documentation methods;**
measured drawings,
written documentation
and photographic documentation.

The ideas of an application and management of architectural historic documentation will be presented as part of the overall knowledge of building preservation.
For measured drawings, we are to document historically and architecturally significant buildings in the form of as-built drawings.

GROUP
The task requires 20 - 40 people per group that will be involve in field works consisting **measuring technique such as**
photographing,
sketches,
use of theodolite
and measuring tape.

REQUIRED OUTCOMES
The final outcomes of the subject are collections of plans, sections, elevations, details and axonometric views / models; complemented with a report that explains about the background, history, concept, style, construction and ornamentation of buildings.

MEASURING EQUIPMENTS

MEASURING TOOLS
Measuring tools are essential accessories needed to measure physical quantities. The measurement gives a number related to the item under study and the referenced unit of measurement. Measuring tools with perfect methods that describe the use of the tools are the means by which these relations of numbers are obtained. One minor error in measurement ruins the whole project. To avoid such errors, need to be well versed in the different types of measuring tools and their functions.

Following are the types of measuring tools used for all purposes:

Laser measures

Laser measures are a highly efficient way of measuring distances on all terrains. By using a laser to target and record a point of reference, the device then calculates and displays the distance to that point with a high degree of accuracy. Offering a measurement solution that is far faster and easier than a conventional tape measure, laser measures are highly versatile devices that have proven beneficial to many industries.

Angle Locator

The angle locator is sometimes also known as an angle finder. It is the perfect tool to measure angles and replicate the angle of an existing area. It is a manual tool with a digital display.

Bubble Inclinometer

An inclinometer is essential and a smart choice to determine a particular inclination. .

Digital Angle Gauge

to measure angles, and they need access to accurate data so angle gauges have been invented. These types of measuring tools allow quick measurement of any angle surfaces attached to them.

Caliper

A caliper is a measuring tool used to measure the dimensions of an object such as thickness, outside and inside diameter, length, width, and depth. These measuring tools provide multiple dimension measurements and are usually made of steel.

Level

It is a type of measuring tool that is used to indicate the horizontal plane.

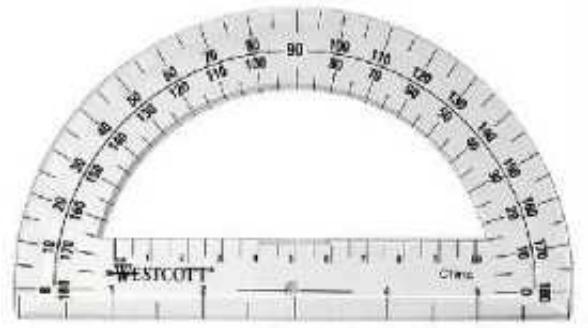
Laser Level

Laser levels are commonly used for leveling and aligning

Measuring Squares

to check the accuracy of right angles .A square is a tool used to mark and refer to a 90° angle, although a miter square is used for a 45° angle. A square measuring instrument consisting of two straight edges set at right angles to each other. These tools are available in a variety of special forms such as combination squares, drywall squares, framing squares, and speed squares.

Protractor



Protractors are measuring instruments usually made of plastic or glass shaped like a half-circle. These are used for measuring angles and are usually marked with degrees.

Ruler

A ruler is a tool used to measure distances ,used to ensure accurate measurements on flat surfaces.

Tape Measure

A tape measure is a flexible ruler that can be folded into any shape and used to measure size or distance. In their simplest form, they are consist of a ribbon of fabric or plastic marked with measurements in inches, centimeters, and/or millimeters.

The most common tape measures are ranges from 12 feet, 25 feet, or 100 feet in length. Its design allows large length measurements to be easily carried in the pocket and also allows measuring curves or corners.

MEASURING REQUIREMENTS

Ladder

A 5 foot ladder was used when required to measure higher parts of the shop houses such as the pinnacle of columns, doors and windows.

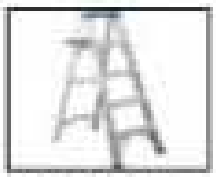


Figure 1.7: 5 foot ladder

Digital Single Lens Reflex (DSLR) Camera

DSLR cameras were used to capture clear and detailed photographs of the shop houses for recording, documentation and photo book purposes. They were also used to record ornamentations, in which they were photographed and traced back into AutoCAD.

Figure 1.8: DSLR Camera

Butter Paper

Butter papers were used as the initial medium to draw the layout of the shop houses in order to record the measurements before they were transferred into AutoCAD.

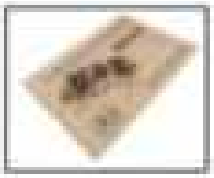


Figure 1.9: Butter paper

Graph Paper

At times, graph paper was also laid under the butter paper when drawing as the grid enables greater accuracy when drawing out the dimensions of the shop houses.

Laptops

Laptops were brought to site and used to produce AutoCAD drawings directly after the measuring process was completed.

BEFORE THE SURVEY:

- Before even going to site, try and find out as much about the building as can.
- Check out google maps to get an idea of shape, orientation, street view etc.
- In some cases almost sketch out the building before even arrive on site.
- Its nice to arrive to do a survey with a bit of familiarity, and understanding of the building.
- It is also important to know why - measuring the building, as this will determine how detailed final drawings will need to be.

THE SURVEY

Arrival on site:

The first thing when arrive on site to do a measured survey is have a look around the entire building, get a feel for the layout, where the rooms are, stairwells, etc. This is helpful for when - start to draw out the building.

SKETCH OUT OR FIELD NOTES

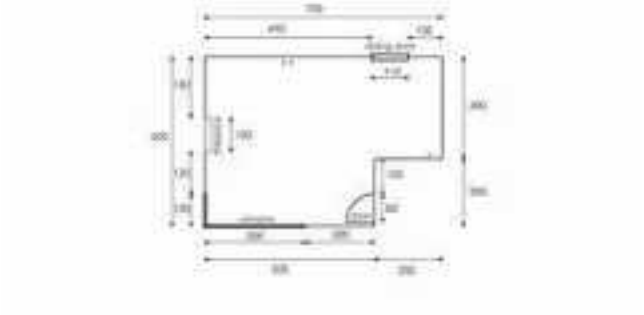
- Depending on the size of the building surveying, may want to break it up into sections, so each page have a section, so that draw it out at a large enough scale to add measurements/dimensions.
- either draw each section as go – draw, measure, next area, draw, measure, next area etc. Or draw out the whole building then go round and take measurements. Whatever works
- If have a tape measure, it is usually best if there are two members, but can do it alone, it will just take a bit longer. With a laser however, it is pretty easy to get everything measured alone.
- Make sure start by labelling on notebook or sheet of paper with the project name and either room name, section of building, floor number etc.
- It might seem obvious now but when have pages of survey drawings sometimes it is difficult to figure out what is what.
- we may also find not going to be the person drawing up the survey, so making sure everything is well labelled and clearly noted will be really helpful.
- use a three colour pen to draw out surveys. use one colour for general drawing and measurements, then another colour for window information (cill height, window head height), and finally another colour for all heights and levels – ceiling heights, floor levels, steps etc. This is really useful when back at desk trying to figure out what the random numbers are floating around on drawing.

MEASURING PLAN

Start measuring in one corner of the room and work way around in a clockwise/anticlockwise direction. This way won't miss anything. It is also wise to take a few diagonal measurements to help with accuracy.

Take measurements at a height where will pick up the features like windows and doors, usually at about 1m high. It is helpful to take running measurements, along with a full measurement of each wall. Running dimensions mean that there is less chance of making mistakes. It may be more time consuming on site, but I always try and take as many measurements as possible.

Make a note of wall thicknesses, which will vary internally and externally.



MEASURING A ROOM

When measuring a room, tend to get a couple of overall measurements of the longest walls, along with some diagonal dimensions in case the room is not square, then more detailed measurements of wall to window, window width etc. working way around the room.

Where possible try to get an overall measurement between two rooms. Using laser measure from one wall in one room, through the door to the wall in the adjoining room. This helps with linking the buildings rooms together.

MEASURING HEIGHTS

measure ceiling heights, and if possible pick up the floor thickness (usually possible to do in a stair area), which will help with elevations and sections. use a different colour to show all heights, which helps when drawing up survey back at the office. Make sure to take note of any ceiling height change, any beams or structural

elements, picking up the underside height of the beams .Try to note where the ceiling height changes wherever possible.

MEASURING DOORS AND WINDOWS

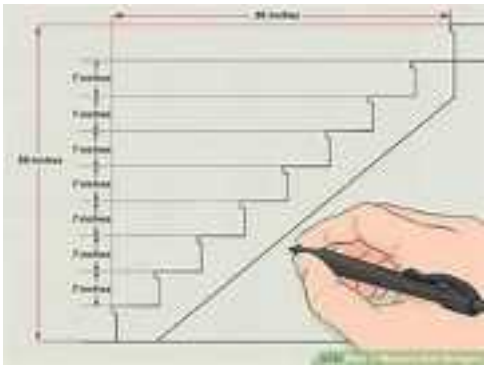
Measuring doors, measure the door size, and the general outline frame details. Be mindful that the doors are likely to be the same throughout the building so may not need to measure every door, but there can be variations. Remember to measure the height of the door and note up on the drawing. For windows, measure the structural opening rather than the frame. If there is something in front of a window that stops measuring the cill height, some furniture or a kitchen worktop for example, can measure the ceiling height and the cill to ceiling height to work out the cill height.

HOW TO MEASURE STAIRS

Stairs need to be considered in both plan and section or height terms. In plan, easily measure the width of the stairs, and the tread or going of the steps. count the risers and make note of any landings in the stair. Depending on the complexity of the stair, sometimes it is worth sketching it out separately on a larger scale for clarity.

Make sure to take as many measurements as possible to demonstrate the link between the two floors. When measuring the risers, ensure into account the nosings of the steps. Count the steps and mark on the drawing, especially when there are landings on the stair.

For the stair height, if possible measure the height from the top of the stair to the bottom, the overall height. then divide the height by the number of risers which will give the individual riser height. Additional dimensions such as ceiling heights from landings, any cill heights of windows on landings and any distinguishing features should all be noted where possible.

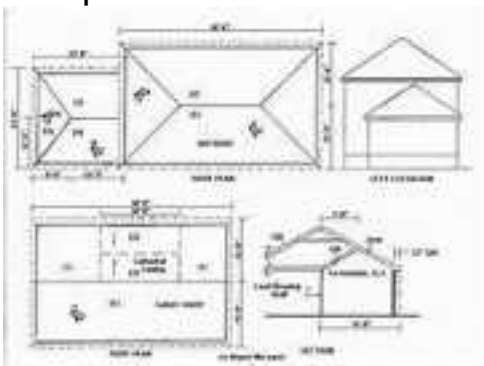


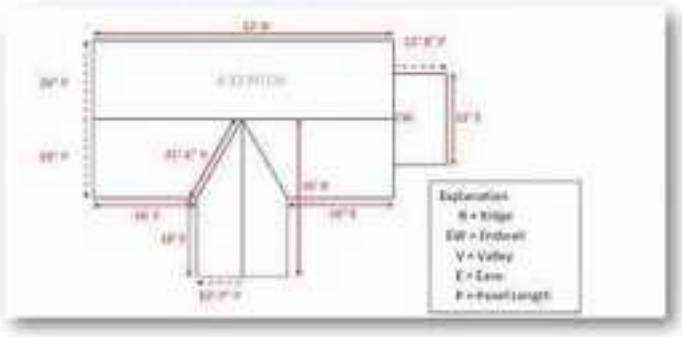
ROOF MEASUREMENTS:

Finding roof heights and details can be difficult and is very dependent on the building. Here are a few tips on how to measure the roof height. If possible it is best to have a laser measure when taking dimensions for roofs.

Externally, try to take a floor to underside of eaves measurement. Check weather the ground level varies around the building and find some constant that can measure from. Next, if the building is brick built or has a uniform facade (regular stonework, blockwork etc), take flat good photographs, and use these to count bricks/block and then work out distances from there.

Internally, make sure to thorough with floor to floor, floor to ceiling measurements. If can gain loft access this is ideal – make sure to have safe access and it is safe for to enter the loft space. then get underside of ridge measurement from the top of the ceiling joists, and take measurements of the rafters etc. Treat this area in a similar way to any other room, get as many dimensions as safely, and take heights and dimensions of purlins and any other features worth noting. With this information will be able to work out the approximate height of the roof, and consequently the angle. Make sure to get some levels too, take a measurement from the finished floor level inside the loft down to the floor level below. Make sure to take photographs of the loft space too.



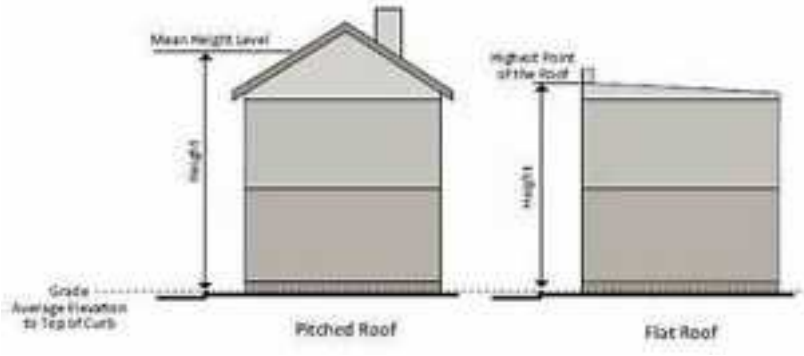


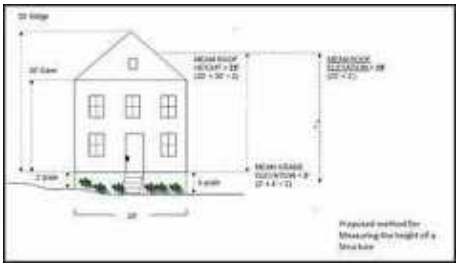
HOW TO MEASURE FOR DRAWING UP A SECTION

draw up most of a section from the survey have carried out to create floor plans. There are however, a couple of things to look out for when surveying for a section. By know the part of the building to take a section of, it is an idea to check all ceiling heights on that section line. Make sure to have the room widths, window heights and any other measurements of elements that will be revealed in the section.

HOW TO MEASURE FOR ELEVATIONS

Sketch out the elevations and measure key features . If using a laser measure, try and measure the eaves and if possible ridge height. If the ground level varies, take a constant feature on the elevations, for example a window cill, and measure to the ground from this point around the building. This will show the changes in ground level. Most of elevations will be possible to draw from the floor plan, but pick up any features that are external only. Take note of any steps, ramps, changes in level and anything that won't have been picked up from the internal survey. Again, take loads more photographs.





MEASURING DETAILS AND ORNAMENTATION -

Details are of the repeated from room to room in a building

It is useful to create a schedule of typical details in order to avoid unnecessary repetition

When measuring Details be clearly, systematically referred to their appropriate locations on the plan, elevation and section field notes

Moldings are best captured using a toothed molding comb and traced at full scale on to the field note paper

Some details such as incised inscriptions may be best captured by simple rubbing using a pencil and the field note paper

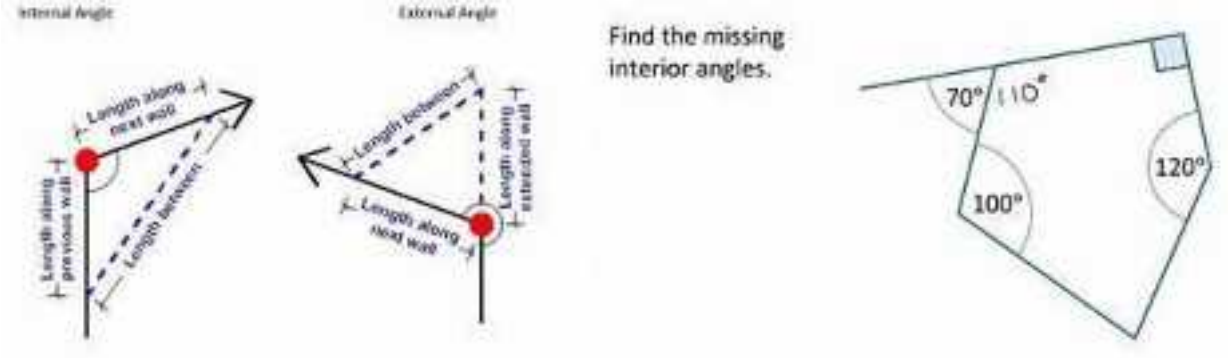
Digital photographs are useful for capturing small, relatively flat details.

Details too large to be sketched to a full scale proportionately and at an appropriately large size on the field note paper and measured accordingly

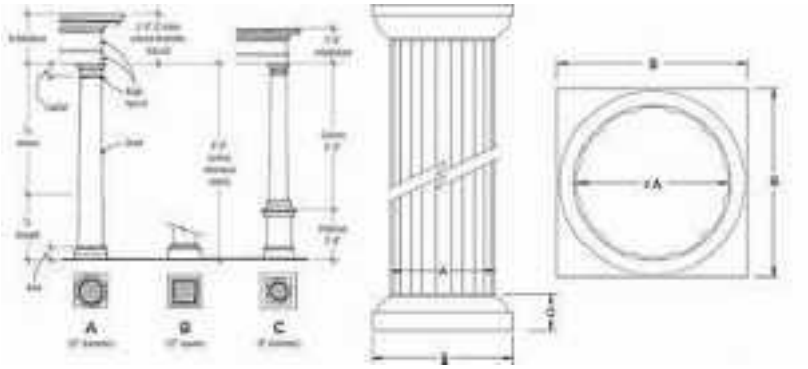
PHOTOS:
Usually after measuring either a room/area take photograph the entire room – focusing on any difficult or complicated areas. tend to take far too many photos .It is always a great help when back at desk trying to draw up the scribbles! In some cases take a video of each room, which is quite useful as can pause it to check any particular details. Take photos of the outside of the property from various angles and if necessary from down the street too. Depending on the reason for survey, sometimes photos from a distance can be useful for planning, or perhaps for creating a street view visual of the proposed plans.

MEASURING ANGLES and IRREGULAR ROOMS
One method to measure angles of strange shaped buildings is triangulation.

Pick a point on one wall (A) and measure to the corner. Pick a point on the second wall (B) and measure to the corner. Finally, measure the distance between the two points on the wall (C). This will give you the measurements of all three sides of the triangle. From this can either work out the angles, or draw it up in cad more easily.



MEASURING COLUMNS
Columns are measured circumferentially at regular, precise vertical intervals such as one feet interval on a ten foot tall column in order to determine entasis



AREA THAT IS TECHNICAL OR DIFFICULT TO PRESENT
area that is technical or difficult to present on drawing, sometimes draw it at a large scale and cross reference it. This allows to create a more detail sketch of the difficult area to refer back to.

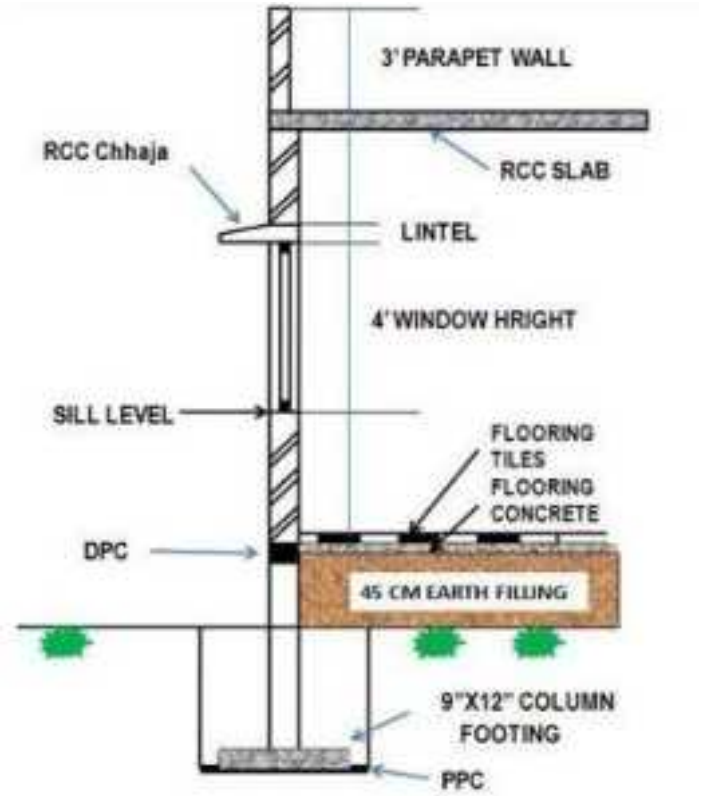
Try to ensure laser is as level as possible when taking measurements. need to take smaller measurements, it is often better to use a tape measure .Try not to rush the survey. Be particularly careful on site
When measuring external information, be sure to take note of site boundaries, and any neighbouring property information that might be useful.

CHECKLIST:
Here are some things to make a note of or check:

- Ceiling heights
- Structural – beams and columns
- Floor levels
- Steps – changes in levels
- Door heights
- Wall thickness internally and externally
- Chimneys
- Window cill heights and window head heights
-

OTHER NOTES

BUILDING STRUCTURE COMPONENTS



Here are the 14 most common building structure components:

Foundation

The foundation is the lowest load-bearing part of a building. The foundation is usually concrete, and it is the first component built. The foundation distributes the weight from the structure on top evenly onto the soil underneath it.

A well-made foundation can prevent common construction problems for a building that can develop over time, like a cracking foundation or uneven load-bearing. A foundation's success depends on how well it transfers weight to the soil underneath it, so construction

teams may study the behavior of the soil in the construction area to construct the right foundation that can work with the soil and prevent sinking.

Plinth

The plinth is the structure component built directly on top of the foundation. It is typically a rectangular wall of stone that goes along the outer dimensions of the structure. The plinth raises the floor of the building to a few centimeters above the level of the soil outside the structure in order to prevent groundwater from getting into the building. This component separates the substructure of the foundation from the superstructure of the rest of the building.

DPC or Damp Proof Course

A damp proof course is a layer of waterproof material that works to keep out any moisture from entering the building and compromising the materials. This layer typically goes on top of the foundation. A plinth works as a DPC, but where there is not a plinth, you can use asphalt or waterproof cement. You can build the rest of the structure on top of this layer.

Plinth Beam

A Plinth beam is a beam that runs horizontally along the foundation from one side of the plinth to another, to support the weight of a wall that will go on top of it. Plinth beams can be concrete or stone.

Floor

The floor is a flat horizontal surface that supports people and furniture. Flooring goes on top of the DPC level, and there are a variety of materials you can use. The purpose of flooring is to provide a dry and hygienic ground to your structure. Depending on the type of building, you can have multiple floors. Any floors below the soil level outside of the building are basement floors. Floors at or slightly above the outside soil level are ground floors. Structures that have multiple levels above the ground number their floors based on their relativity to the ground floor.

Slab

A slab is a vertical base component that works as a floor and a ceiling. In a one-story building, the slab is the roof. In structures that are multiple stories, the slab is the ceiling of one story and floor of the story above it. The slab transfers the weight from the story above it vertically to the walls and columns that support the structure.

Wall

Walls are vertical structure components that support the roof. They also provide security and protection from outside weather. You can use a variety of materials to construct a wall, depending on whether it is an exterior or interior wall.

Exterior walls line the perimeter of the structure and can protect the inside of the structure from weather and moisture, as well as provide privacy. Interior walls make up the design and spatial structure of the interior of the building. Some interior walls are necessary to hold the weight of the roof, but some walls are only used to segment off space.

Shear wall

A shear wall is a vertical component that is reinforced to withstand earthquakes or storms. They work by adding additional support to the wall by transferring additional pressure caused by strong winds or shaking from the vertical wall to the horizontal foundation.

Column

A column is a vertical load-bearing component that supports the roof by connecting it to the floor. It does not protect from weather or provide privacy because it is typically as thick as it is wide and strategically placed within a structure to support weight.

can use a column to support weight instead of a wall, as long as the column is big enough to withstand the weight of the roof and any additional weight you place on it. You can also use a column as a visual feature if it is not carrying weight.

Roof

The roof is the uppermost structural element of a building. It provides covering for the rest of the structure to protect it from weather. You can construct a flat or sloped roof out of a variety of materials, depending on what is best suited for the weather of the region. The roof is a weight that rests on other load-bearing structures. The load that the roof bears is mostly its own weight, as well as any additional pressure from weather.

Staircase

A staircase is made up of a collection of steps that allow movement from one floor to another. It has to bear its own weight and anyone walking on it. You can consider the space available when deciding the layout of the staircase, as well as the materials used.

Tie beam

A tie beam runs between columns to support the weight the columns carry. These are typically used to support columns that are holding up tall ceilings. Columns that are too long need to be reinforced to prevent buckling under the weight of the high roof.

Lintel

A lintel is made of a slab of concrete or metal that goes above an opening in a wall, like a window or a doorway. The lintel supports the piece of wall above the opening, distributing the weight to the stronger sides of the wall on either side, and reinforcing the wall where it is weak, above the opening.

Sill

A sill is a part of a wall just under an opening like a window. You can reinforce the sill to support the weight of the window frame.

VARIOUS TYPES OF LEVELS USED IN BUILDING CONSTRUCTION

1. Natural Ground Level (NGL)
2. Ground Level (GL)
3. Existing Ground Level (EGL)
4. Plinth Level
5. Sill Level
6. Lintel Level
7. Floor Finish Level (FFL)
8. Structural Floor Level (SFL)
9. Structural Slab Level (SSL)

Natural Ground Level (NGL)

NGL is the condensing of the normal ground level. It is the regular degree of ground before any filling or uncovering.

Ground Level (GL)

The term ground level alludes to the structure's level at the ground or closest to the ground level around it.

Or on the other hand

The level situated over the outside street and beneath the completed floor level is named ground level.

The term FGL

Finish ground level alludes to the ground that has been done with tiles, grass, paver squares, arranging, or different means.

Building Ground Level (BGL)

The Level of land or the completed floor level inside the structure is known as the Building Ground Level (BGL).

Plinth Level

A-Level where the foundation closes and the superstructure begins is known as the plinth level. The plinth is a piece of the superstructure situated between the ground level and the completed floor level.

The plinth helps in moving the superstructure's heap to the establishment. It likewise offers security to the structure against infiltration of dampness and a decent engineering appearance.

The basic role of giving a plinth is to forestall the section of water and stormwater into the structure. The soggy confirmation course is additionally presented at the highest point of the plinth, which helps stop dampness development through dividers.

Sill Level

A level between the structure's window base and floor level over the ground level is known as the ledge level. The substantial bed or mortar bed is set at the window base level. Stone is likewise utilized at the base level of the window.

Ledge level tallness changes from one space to another and relies upon the room type.

Lintel Level

A lintel is a flat part positioned across an opening to help the piece of the construction. It gives bearing for the brickwork over the opening and moves every one of the heaps acting over the opening to the supporting dividers.

Generally, RCC lintel is utilized, however, there are different kinds of lintel like Wooden, stone, and Brick are utilized according to reasonableness.

Entryway and window outlines are not adequately skilled to bear the heap brickwork over the opening. Thusly a different underlying component is given to defeating this issue, which is known as a lintel.

Finished Floor Level (FFL)

The structure's inward floor is done with tiles, marble, stone, or different means; from that point forward, no further completing work is required, known as the completed floor level.

DIFFERENCE BETWEEN BUILDING ELEMENTS AND BUILDING COMPONENT

Elements of the building or building structure components are the important sections of a building that together form a complete structure. These elements are used to support, enclose, and protect the structure of a building. building structures have different components.

Residential buildings, commercial buildings, industrial buildings, government buildings, and many other types of buildings exist. The building components may differ depending on the type of building, but all building structures have the same key elements without which the building structure cannot be completed.

Basic components of building structure are listed below.

- Foundation
- Plinth
- Wall
- Column
- Sill
- Lintel
- Chajja
- Door
- Window
- Floor
- Roof
- Stairs
- Finishing Work
- Building Services

SAMPLE QUESTIONS

1. What is celling and types of celling?
2. Explain types of staircases, principles and basic materials used for.
3. Explain door componets,types of doors and material used.
4. Explain window componets,types of windows and material used.
5. Explain ventilator, sketch the standard sizes, and location of ventilator.
6. Explain below components with sketches

a. lintel
b. Sunshade
c. Coping
d. Cornice
e. String course
f. Parapet

7. In detail explain types of foundation with sketches.
8. What are different types of structural systems? Explain in detail.
9. Explain the need of enclosures.
10. Explain the need of water proofing/weather protection.
11. Explain the need for plinth in building.

12. With neat sketches explain the types of wall.
13. With neat sketches explain flooring and their types in detail.
14. Explain types of roofs with sketches.
15. Explain roof covering.
16. Why there is need for parapet?
17. Explain building finishes and finishes types on det.
18. What is mortar?
19. Give examples for paving materials and write thickness of paving for various purposes.
20. Explain concept of scale and understanding on scaling of building components.
21. Explain orthographic projections in detail with drawings.
22. What is measure drawing?
23. Explain uses and importance of measure drawing.
24. Difference between building materials and building components.
25. Difference between building element and building components.
26. Explain contribution of representation drawing in understanding of building components.
27. what are the different aspects to consider during the drawing of historic buildings and contemporary buildings?
28. Explain tools and methods used in the documentation of historic buildings and contemporary buildings.
29. Explain steps to consider in documentation of historic buildings and contemporary buildings.
30. how to measure various building components

a. 1coumn
b. 2.arches
c. 3.plan – rectangle, circular,
d. 4.dome
e. 5.pediment

31. Explain significance of proportion sketches in measure drawing.
32. Write shortly on space frame structure.
33. Write shortly vaulted roofing stem.
34. Difference between load bearing and non-load bearing structure.
35. Draw stone foundation and label it.
36. Define vanishing points.
37. Write shortly on dome.
38. Explain types of sunshades
39. What is the meaning of representational diagram?

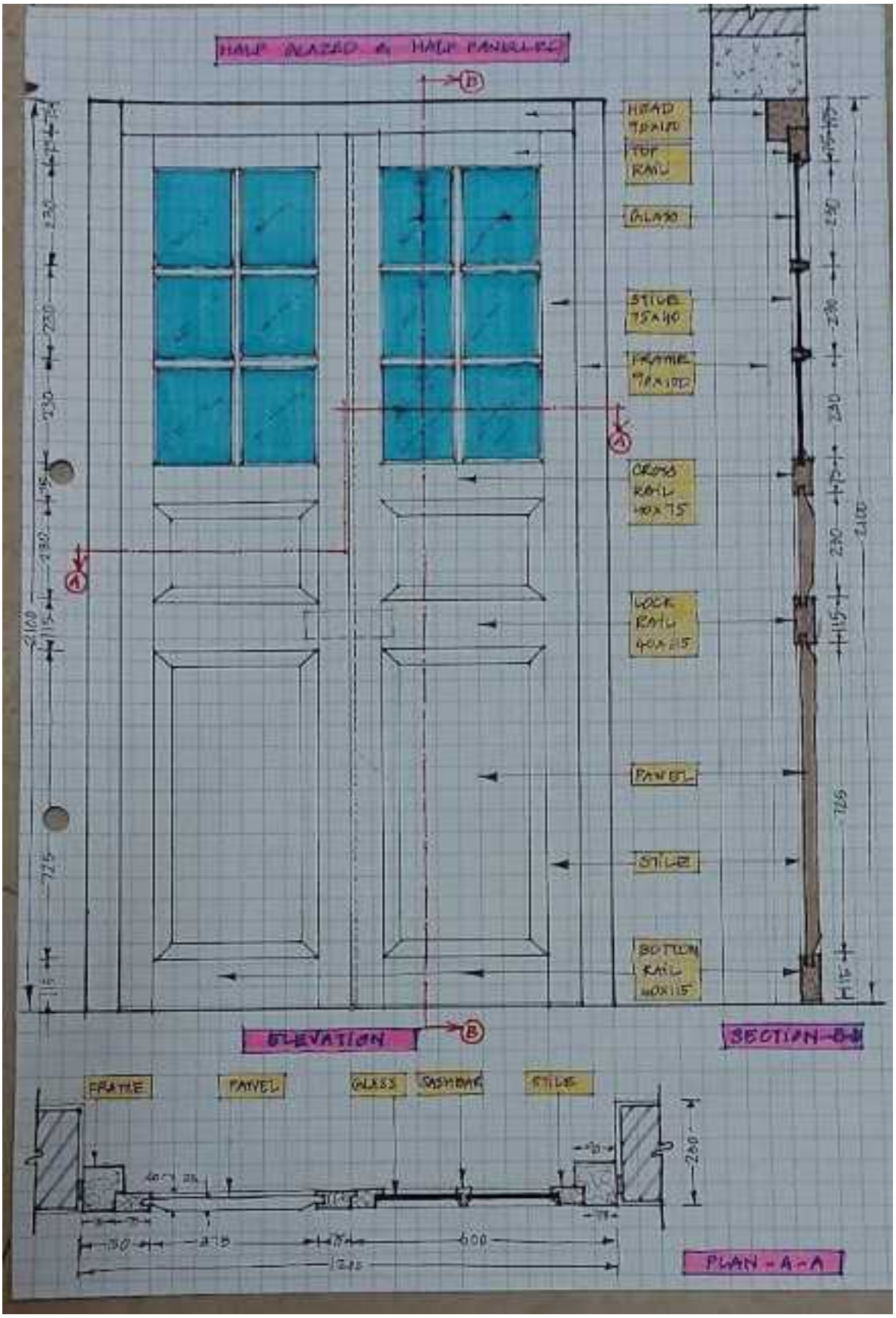
SAMPLE QUESTIONS FOR DRAWINGS TO PRACTISE

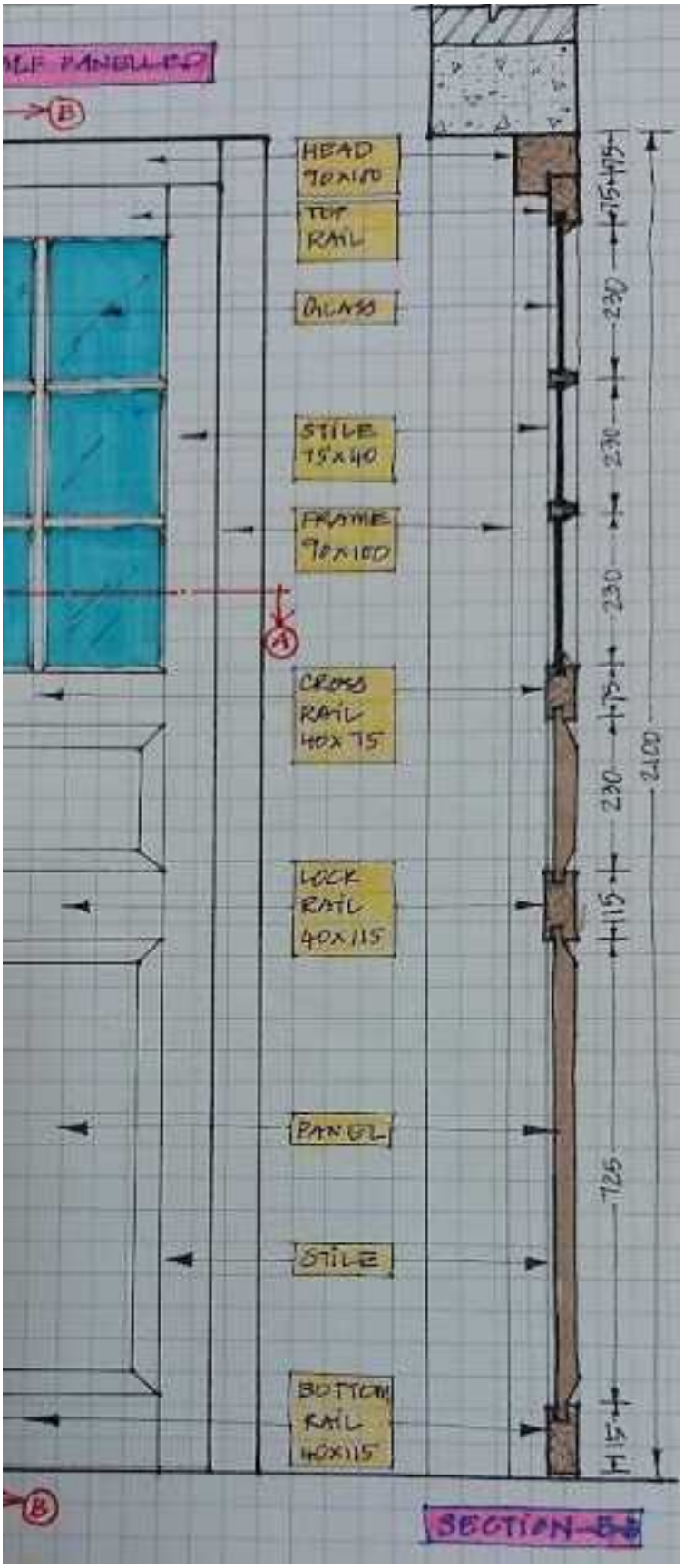
40. With dimensions Draw plan section and elevation of door and label the components.
41. With dimensions Draw plan section and elevation of window and label the components.

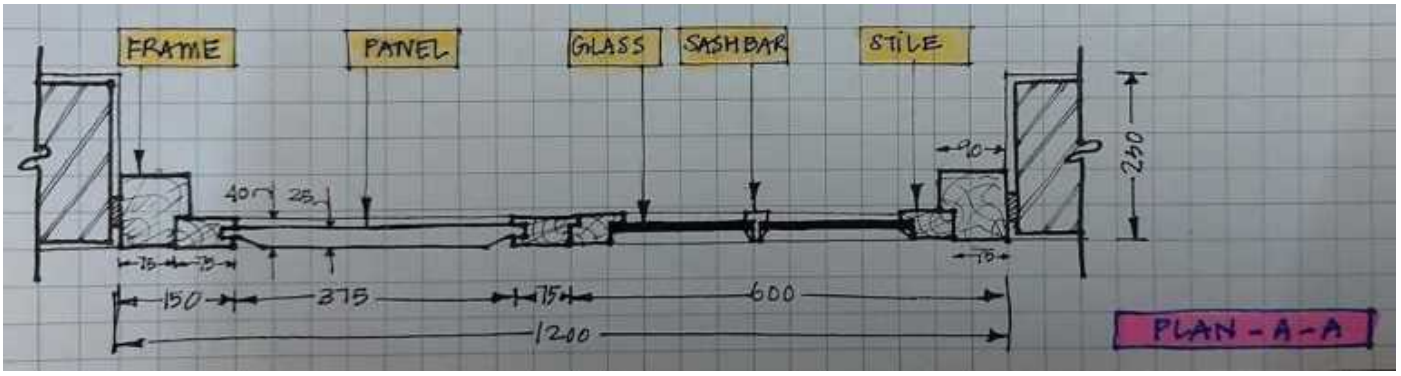
42. Draw plan and elevation of staircase for room of 3m ht and label the components.
43. Draw wall section and explain building components in details.
44. For a given plan draw section and elevation.
45. Draw a bedroom plan and with section drawing explain the height and interiors.
46. Sketch ventilator.
47. Draw isometric view of
a. Furniture
b. Arches
c. Handrail
d. Teapoy
e. Staircase
f. Column

48. Draw load bearing structure section.
49. Perspective of
a. Small room interior
b. Arch
50. Draw representation/rendering of 15 materials in plan and elevation.
51. Draw
a. coping stone
b. Cornice
52. Draw furniture in orthographic view.
53. Draw one point perspective of any building element.
54. Draw two-point perspective of any building element.
55. Draw three-point perspective of any building element.
56. Draw two point, one point perspective of living room with interior
57. Draw one point perspective of building exterior

ADDITIONAL DRAWINGS FOR REFERENCE




HEAD
90X180
TOP
RAIL
GLASS
STILE
75X40
FRAME
90X100
CROSS
RAIL
40X75
LOCK
RAIL
40X115
PANEL
STILE
BOTTOM
RAIL
40X115
175
230
230
230
75
230
115
725
115
2100
SECTION



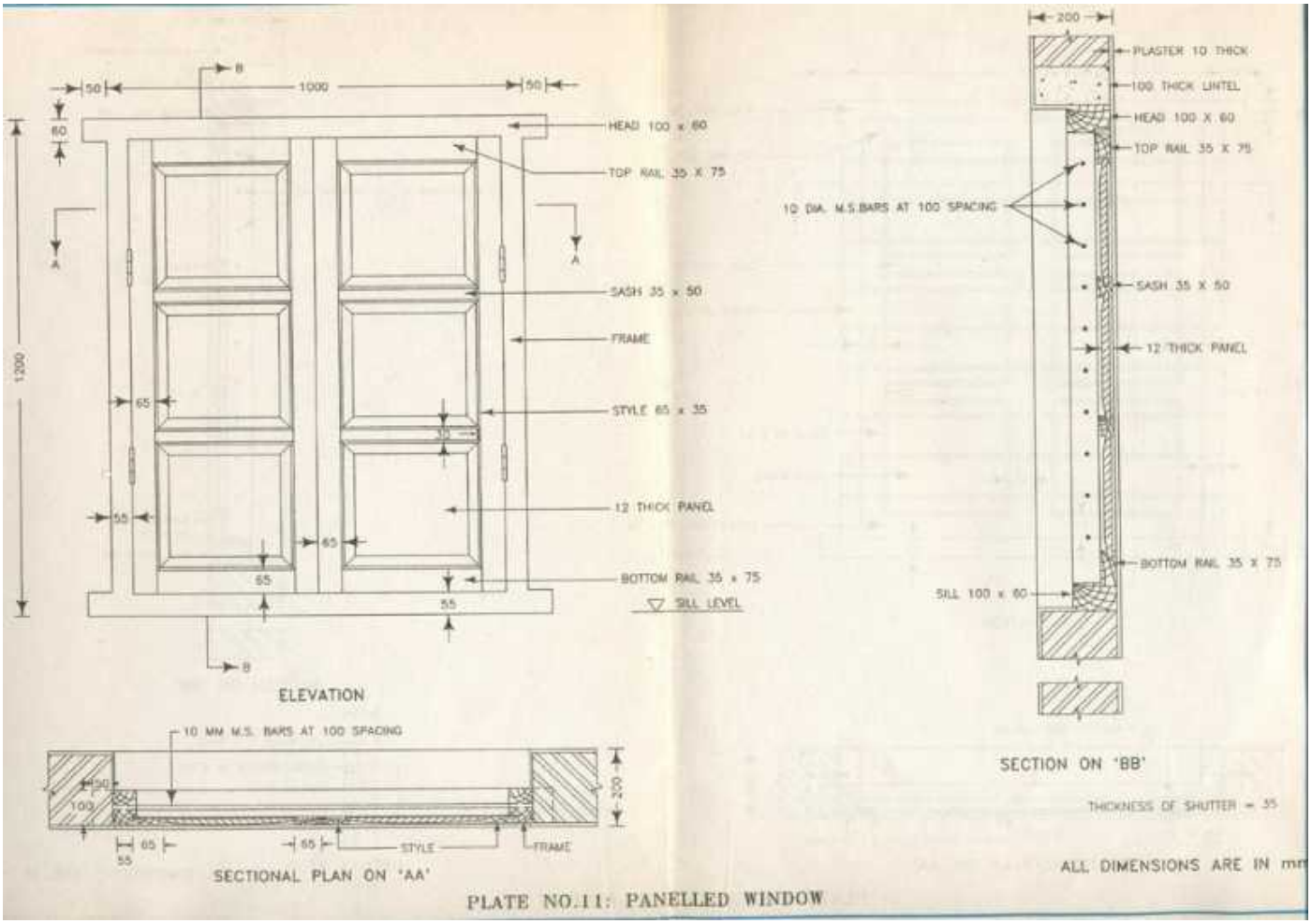
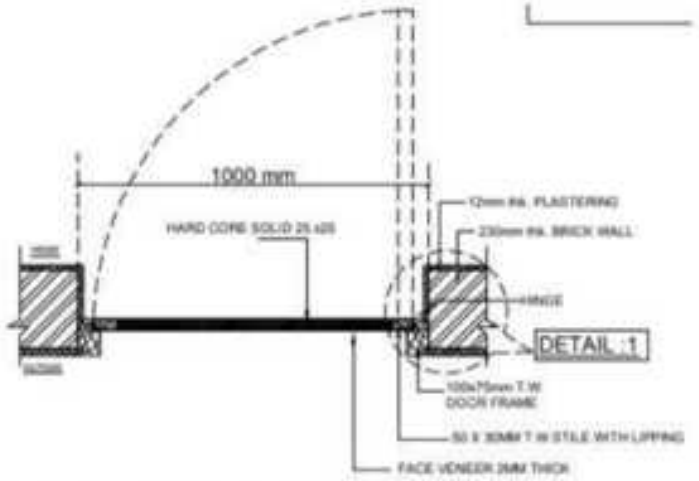
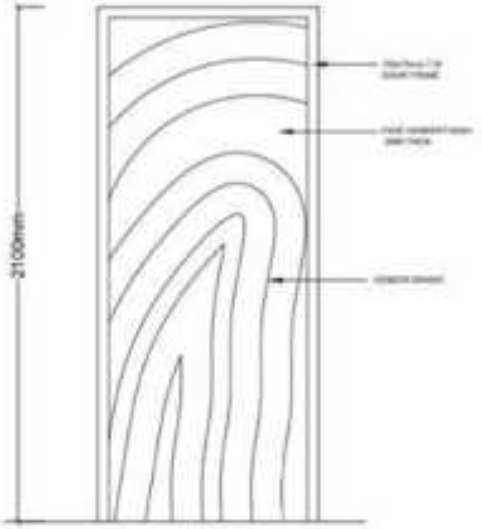


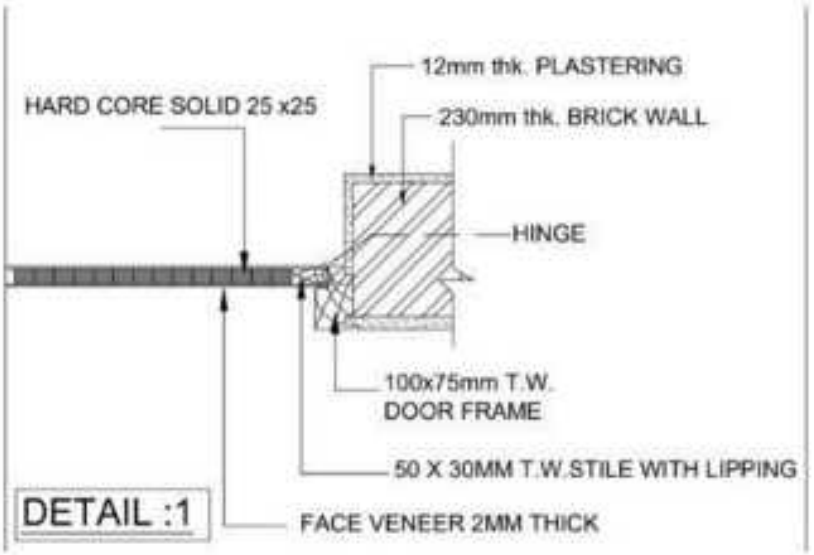
PLATE NO.11: PANELLED WINDOW

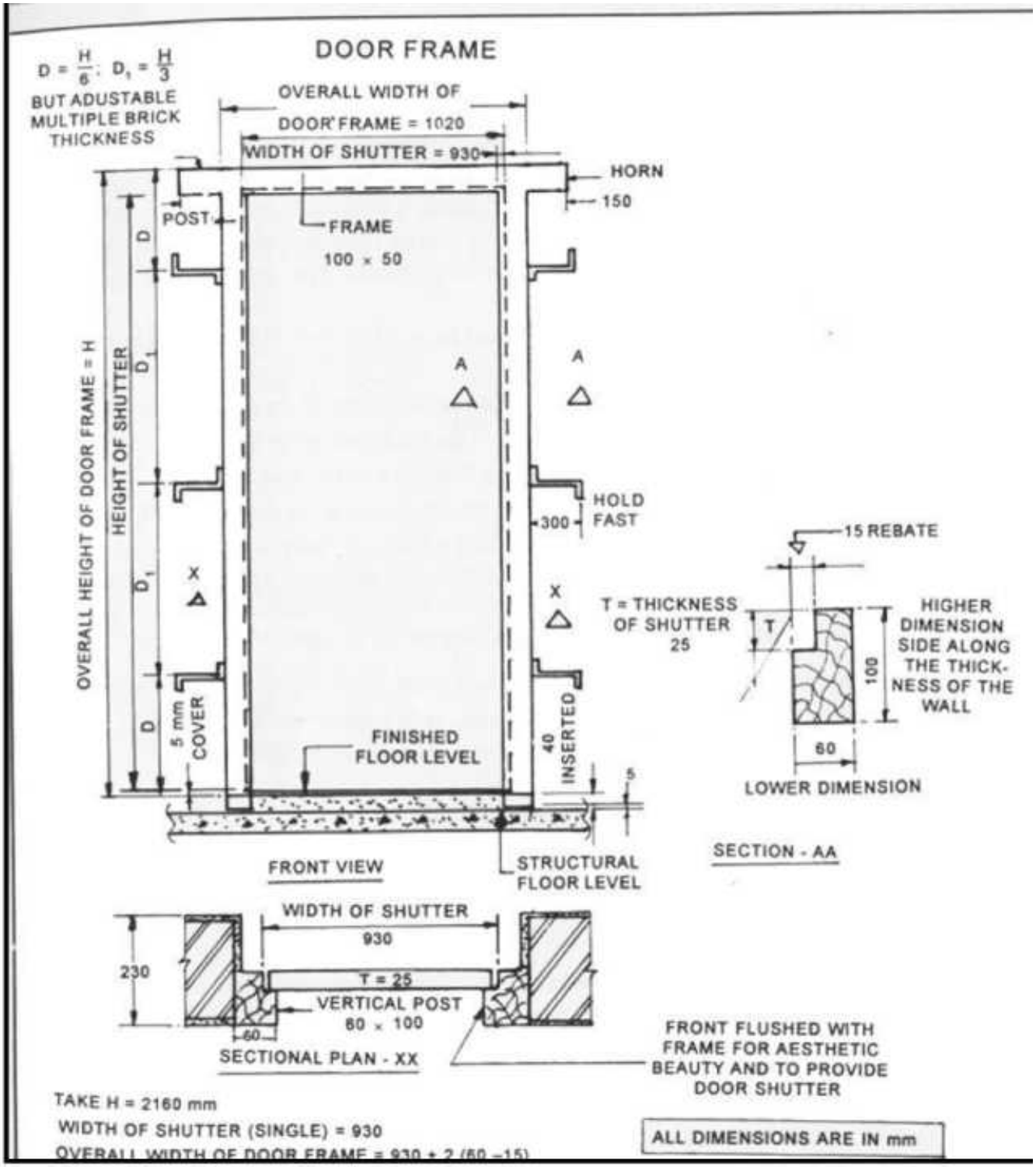


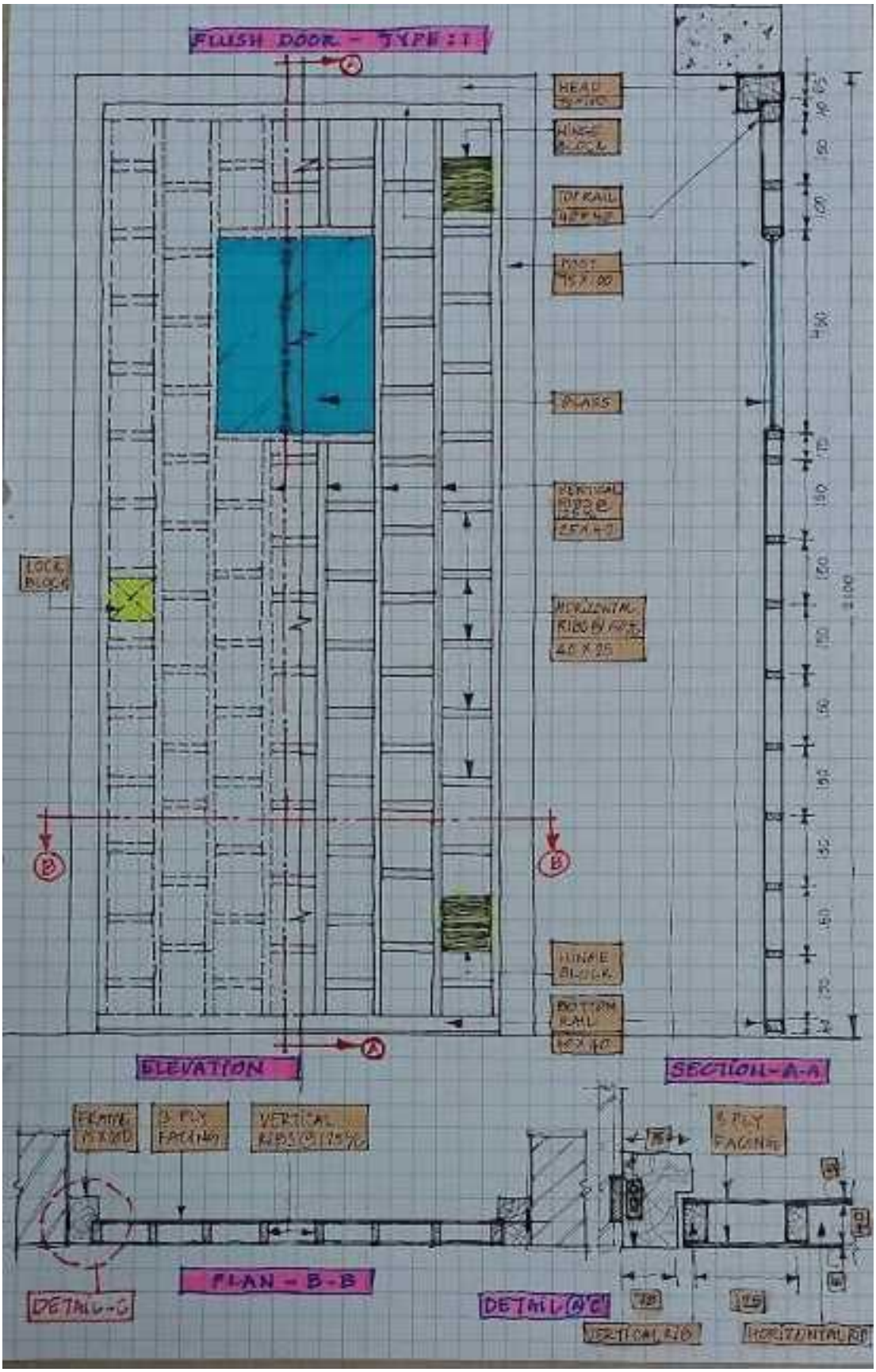
PLAN OF HARD CORE FLUSH DOOR

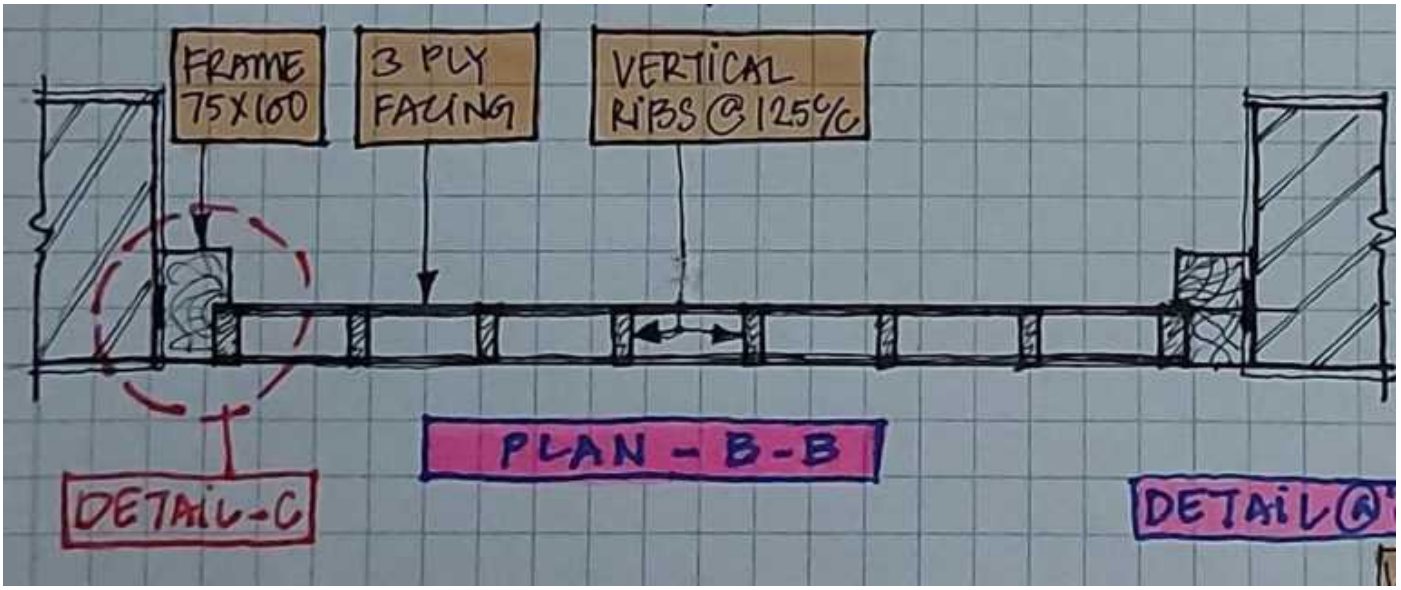


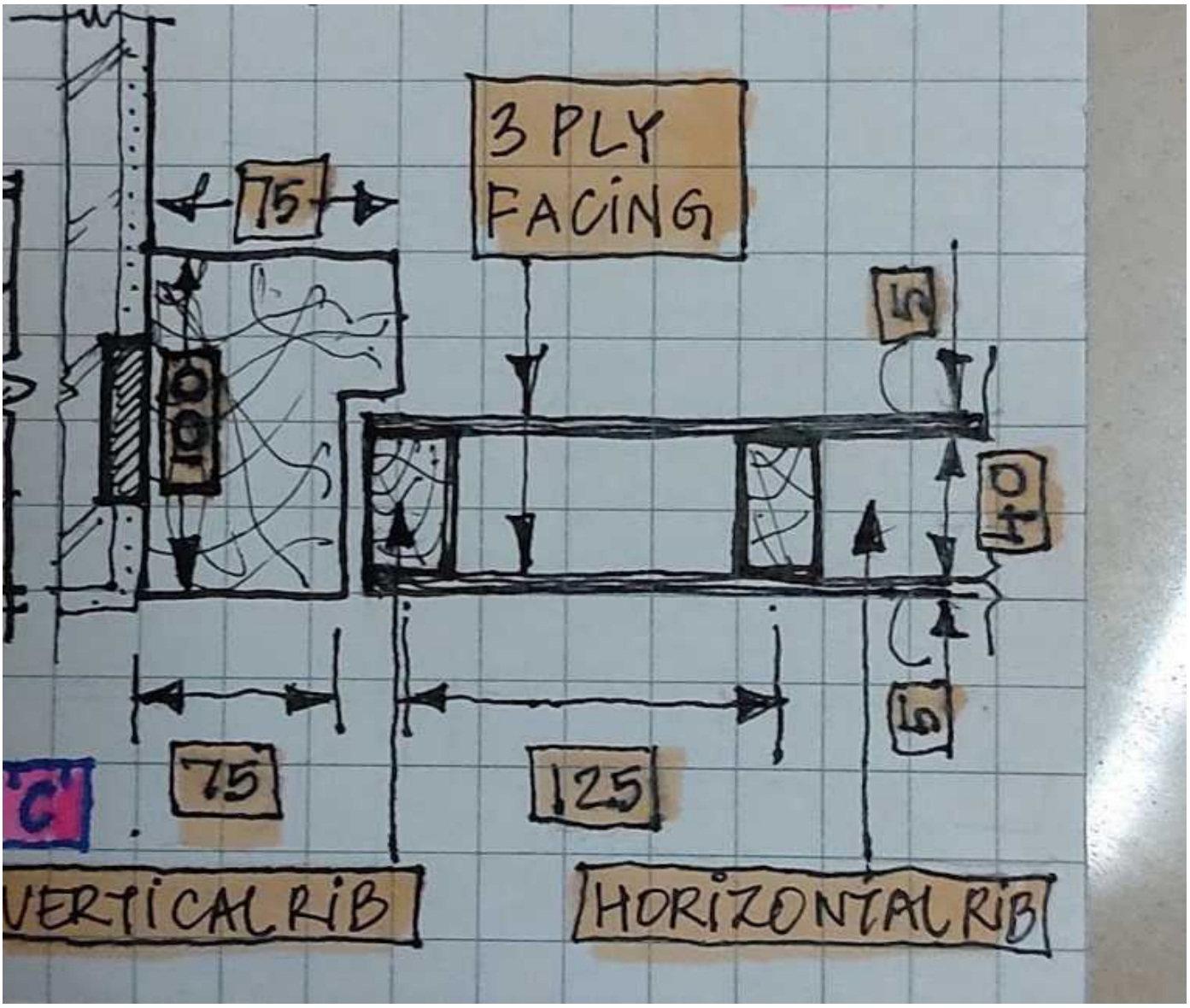
ELEVATION




DOOR FRAME
$D = \frac{H}{6}$; $D_1 = \frac{H}{3}$
BUT ADUSTABLE MULTIPLE BRICK THICKNESS
OVERALL WIDTH OF DOOR FRAME = 1020
WIDTH OF SHUTTER = 930
HORN
150
POST
FRAME
100 × 50
OVERALL HEIGHT OF DOOR FRAME = H
HEIGHT OF SHUTTER
D
D1
D1
D
A
A
X
X
HOLD FAST
300
5 mm COVER
FINISHED FLOOR LEVEL
40 INSERTED
5
FRONT VIEW
STRUCTURAL FLOOR LEVEL
15 REBATE
T = THICKNESS OF SHUTTER 25
T
HIGHER DIMENSION SIDE ALONG THE THICK-NESS OF THE WALL
100
60
LOWER DIMENSION
SECTION - AA
WIDTH OF SHUTTER
930
230
T = 25
VERTICAL POST
60 × 100
60
SECTIONAL PLAN - XX
FRONT FLUSHED WITH FRAME FOR AESTHETIC BEAUTY AND TO PROVIDE DOOR SHUTTER
TAKE H = 2160 mm
WIDTH OF SHUTTER (SINGLE) = 930
OVERALL WIDTH OF DOOR FRAME = 930 + 2 (60 –15)
ALL DIMENSIONS ARE IN mm


FLUSH DOOR - TYPE : I
HEAD
HINGE BLOCK
DP RAIL
MAST
GLASS
VERTICAL RIBS @
LOCK BLOCK
HORIZONTAL RIBS @
HINGE BLOCK
BOTTOM RAIL
ELEVATION
SECTION-A-A
FRAME FIXED
3 PLY FACING
VERTICAL RIBS @
3 PLY FACING
PLAN - B-B
DETAIL-C
DETAIL 'C'
VERTICAL RIB
HORIZONTAL RIB


FRAME 75X160
3 PLY FACING
VERTICAL RIBS @125%c
PLAN - B-B
DETAIL-C
DETAIL @


3 PLY FACING
75
100
15
100
15
75
125
C
VERTICAL RIB
HORIZONTAL RIB

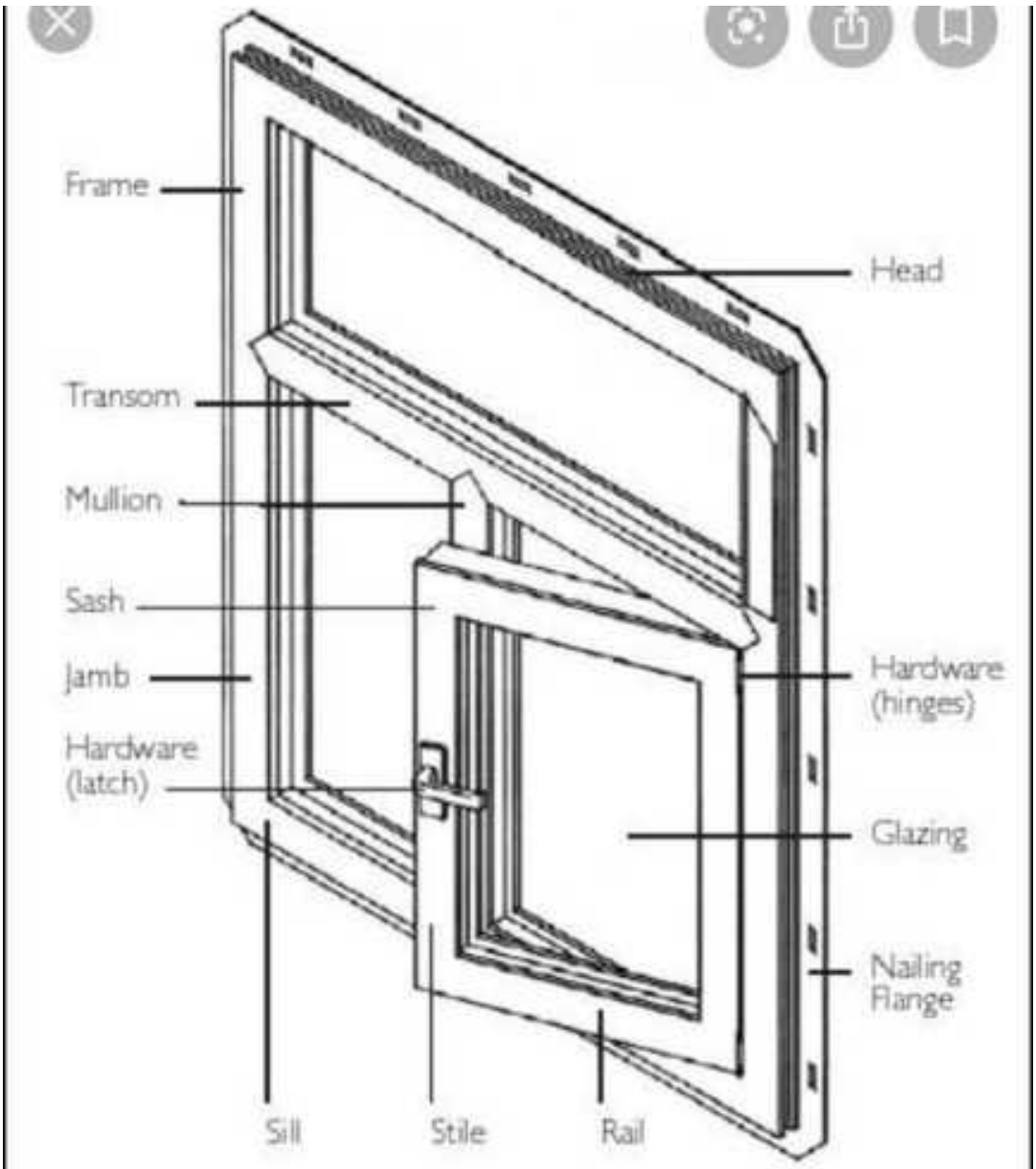
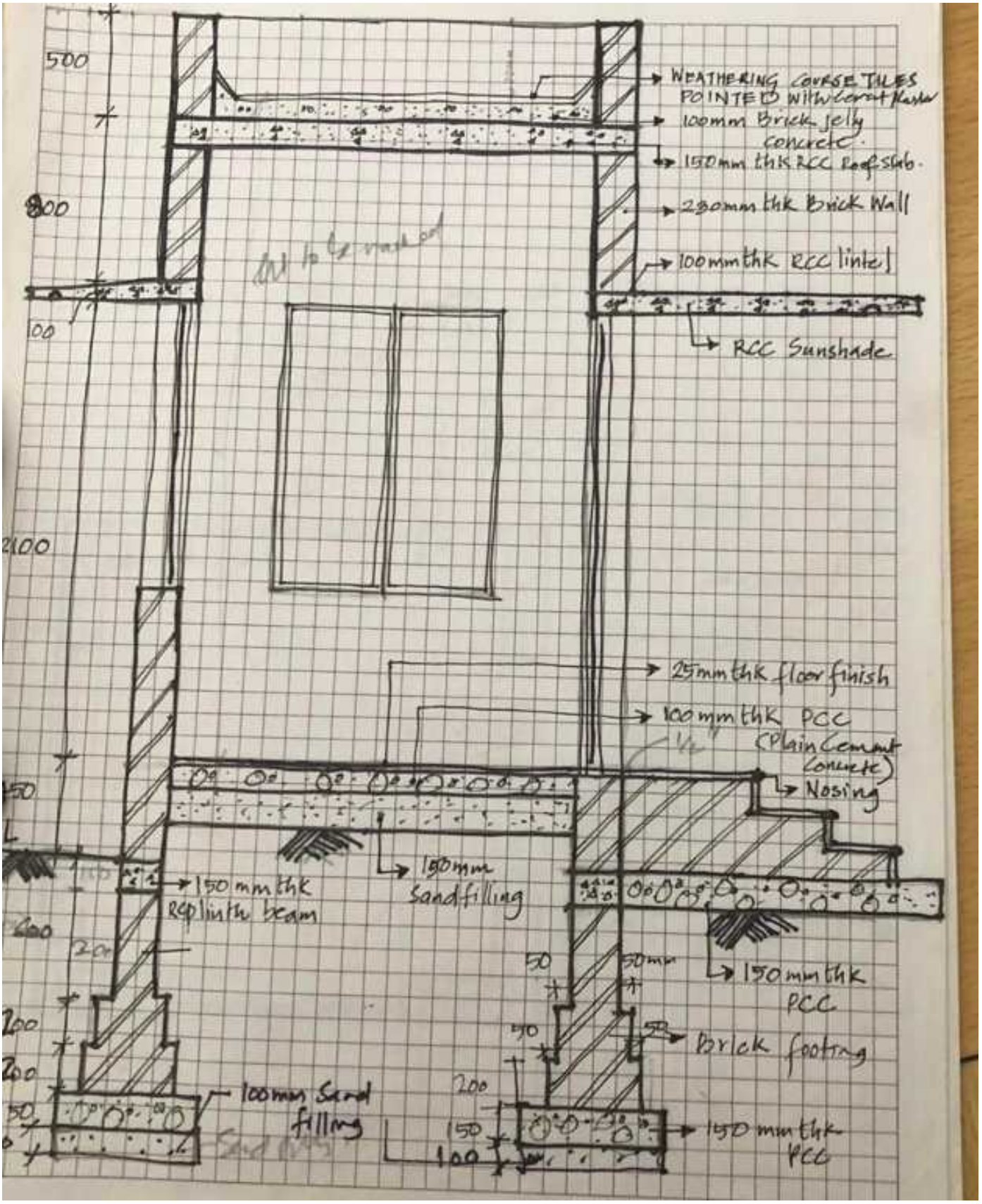
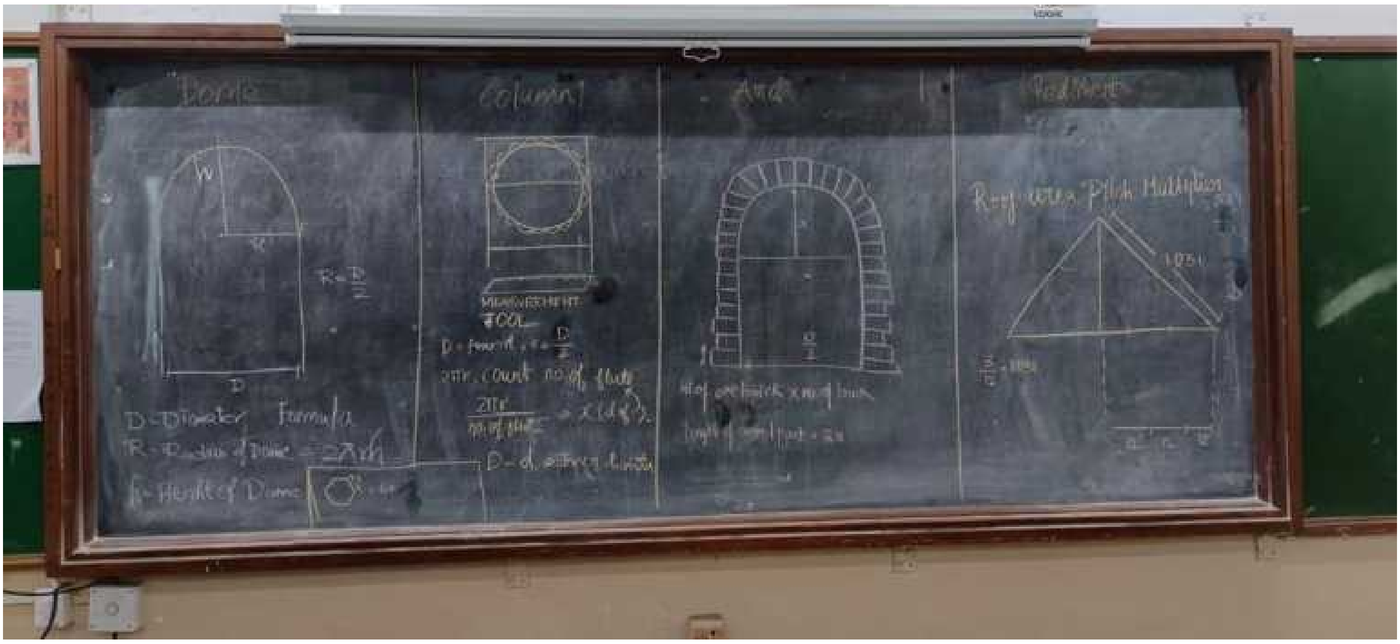
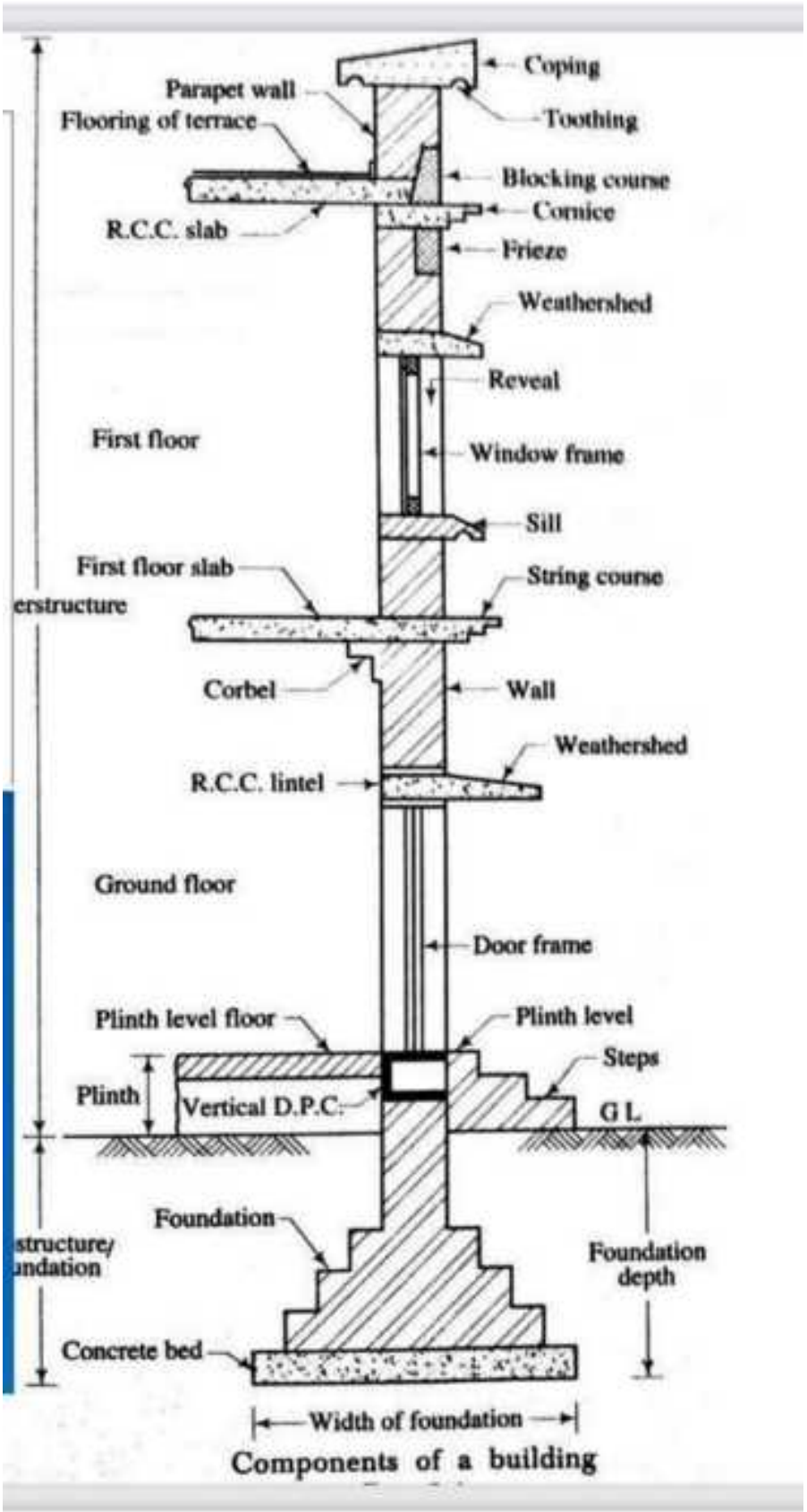


Figure 1 - Components of a window


500
800
100
2100
150
600
200
200
150
WEATHERING COURSE TILES POINTED with Cement Mortar
100mm Brick jelly concrete
150mm thk RCC Roof Slab
250mm thk Brick Wall
100mm thk RCC lintel
RCC Sunshade
25mm thk floor finish
100 mm thk PCC (Plain Cement Concrete)
Nosing
150 mm thk Replinth beam
150mm Sand filling
150 mm thk PCC
Brick footing
100mm Sand filling
150 mm thk PCC
150
100


Column
D-Diameter
Formula



Components of a building

Q.5. Draw the perspective view of a building as shown in figure by two vanishing point method.

Sol. See fig. 54.

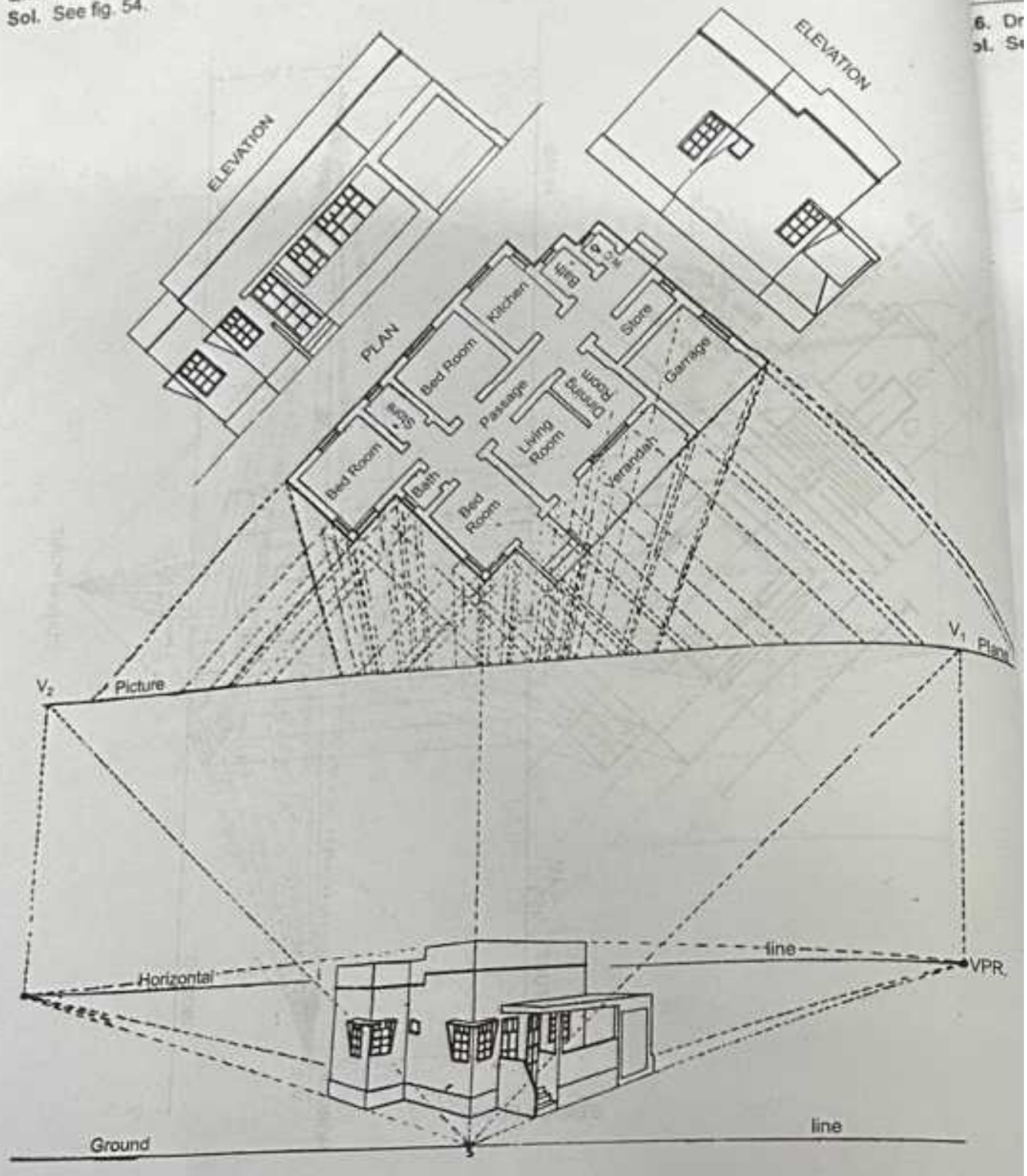


Fig. 54.

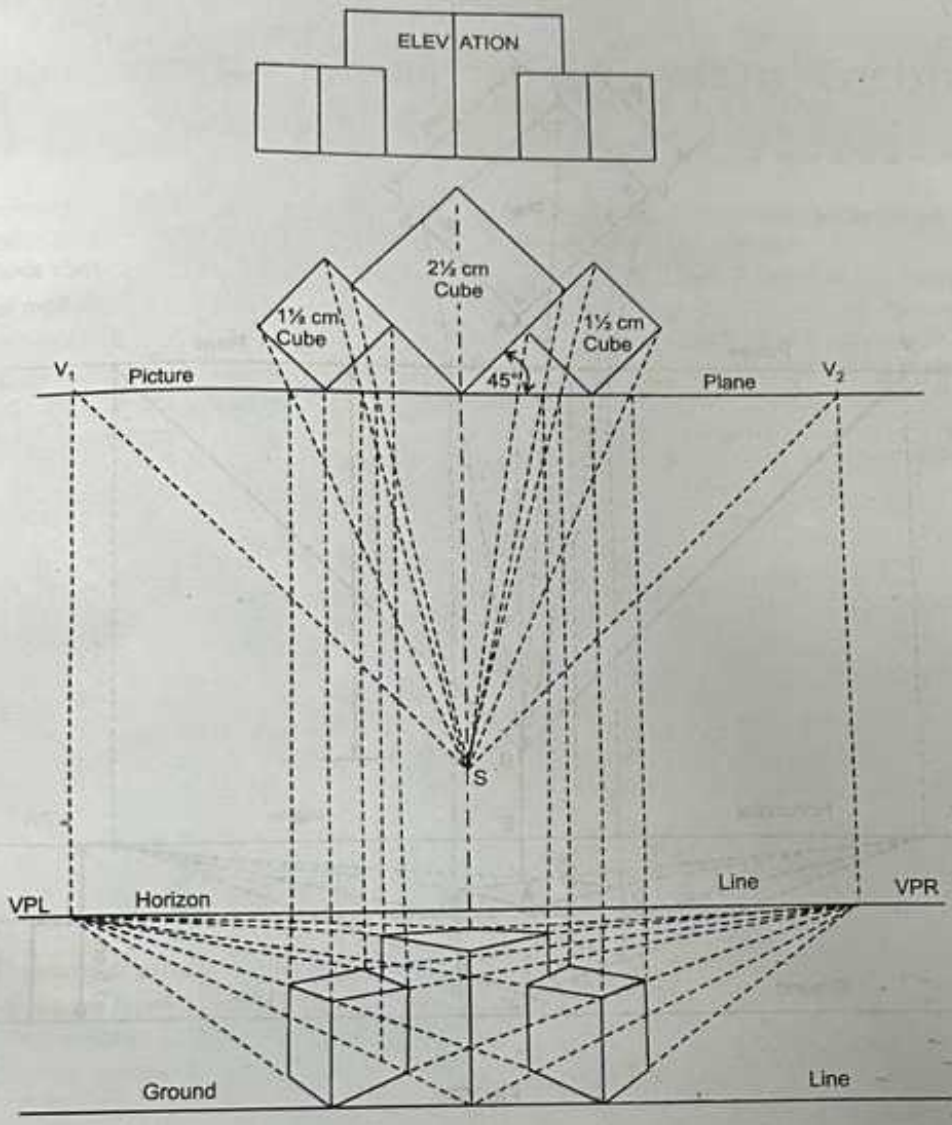

ELEV ATION
2½ cm
Cube
1⅛ cm
Cube
1½ cm
Cube
V1
Picture
45°
Plane
V2
S
VPL
Horizon
Line
VPR
Ground
Line

Fig. 56.

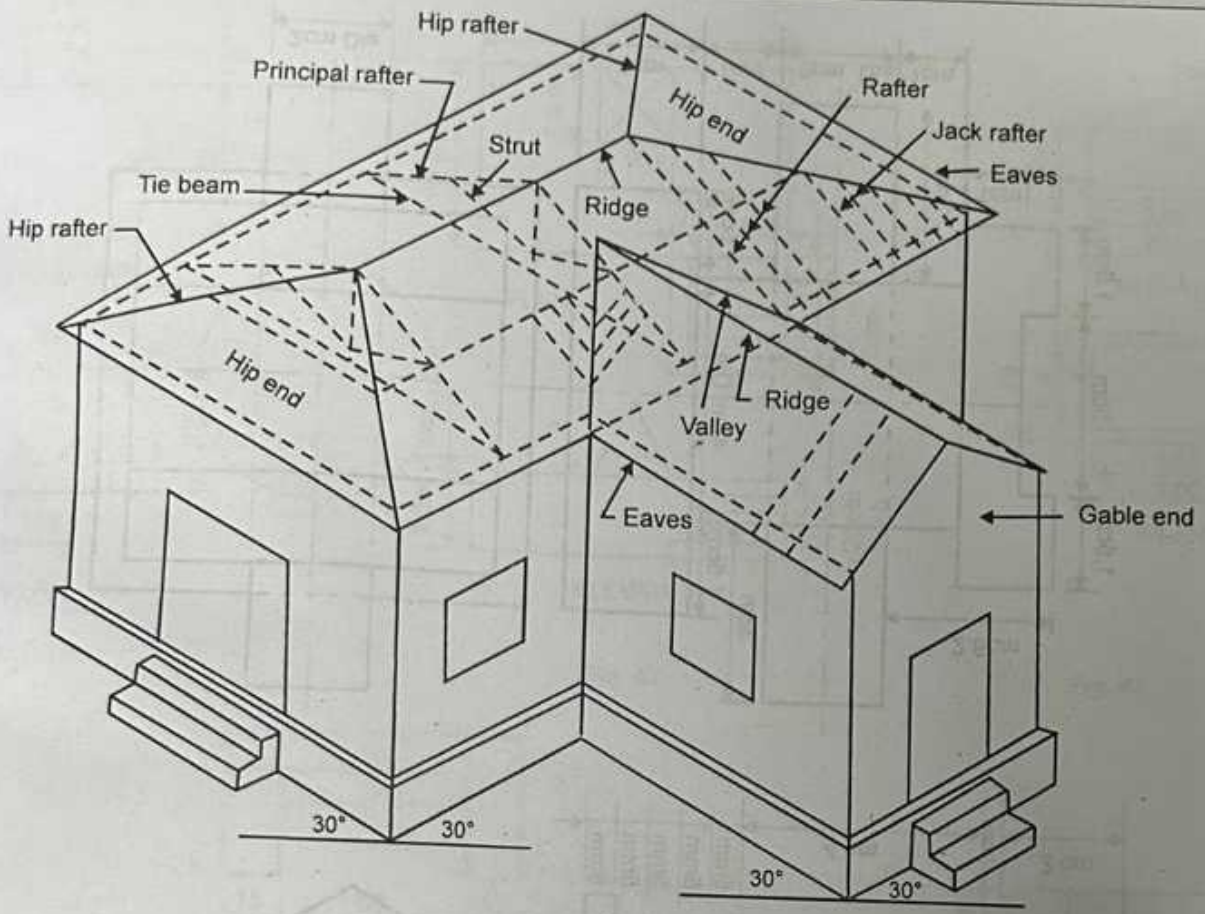


Fig. 38. ISOMETRIC VIEW, SHOWING DETAIL OF VARIOUS MEMBERS

Sol. See Fig. 34.

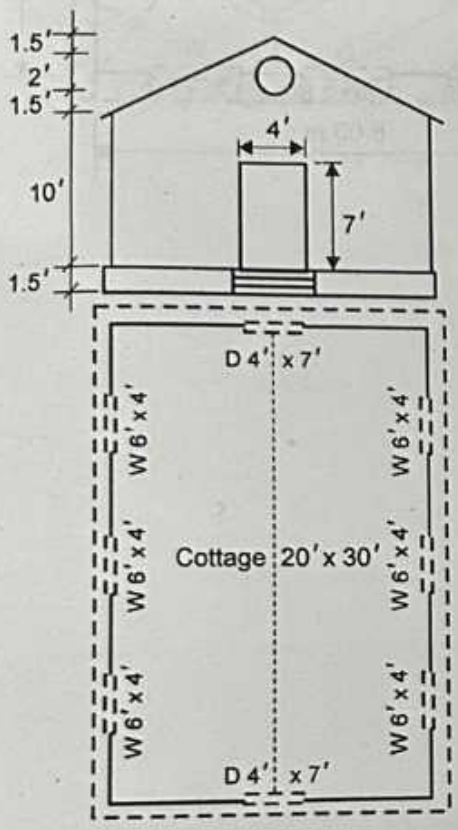


Fig. 33.

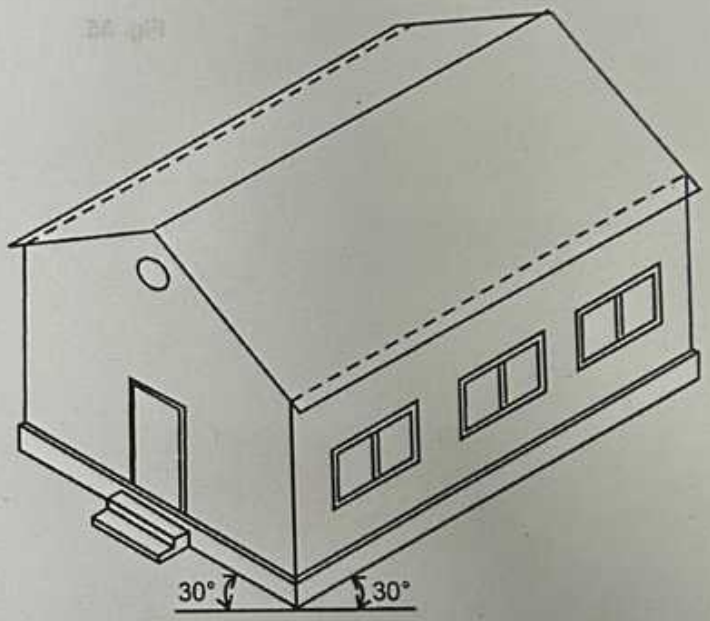


Fig. 34.

AMES OF DIFFERENT PARTS OF BUILDING

The names of different parts of building are as given below:

1. **Plinth.** The horizontal projecting course of stones or bricks which is provided at the base of the wall above ground level is called plinth. The plinth raises the level of natural ground and protects the building from rain and other weather effects.
2. **Sill.** It is the horizontal member comprising concrete stone or wood to give support to the vertical members of wooden window. It helps in shedding rain water from face of wall.
3. **Jamb**: The vertical sides of doors and windows openings are called jambs.
4. **Reveals:** These are the exposed vertical surfaces on the sides of an opening left after fixing the frame of door or window etc.
5. **Arch**: Arch is the arranging of wedge shaped blocks of stones or bricks in the form of curve to support the masonry or load above openings.
6. **Lintel**: A horizontal member of stone, wood, bricks, steel or R.C.C.. etc. above the opening to support the masonry or load above, it is called lintel.
7. **String Course**: String course is the horizontal course of masonry projecting from the face of wall at every floor or sill level. It runs throughout the length of the wall and improves the elevation of building.
8. **Blocking Course**: It is provided immediately above the cornice in stone masonry. It checks the tendency of the cornice to overturn.

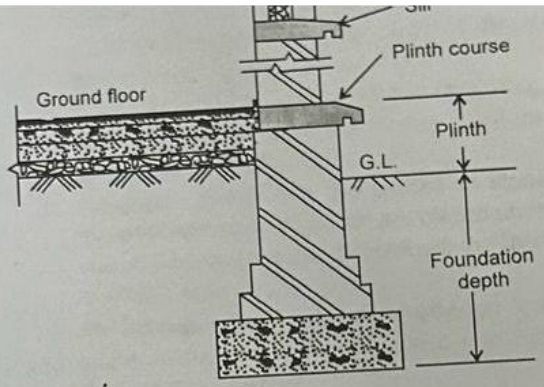


Fig. 1.

10. **Frieze**: It is provided immediately below the cornice. It adds beauty to the wall. It is generally flushed with the wall, but can also be in a moulded form.
11. **Parapet**: It is the wall built around a flat roof which acts as a protective wall for the users of the terrace *i.e.*, roof. In case of sloping or pitched roofs, the parapet wall is used to conceal the gutter at eaves level. It also acts as a architectural feature to cover the gutter.
12. **Coping:** The coping is covering of bricks or stones, concrete or terracotta which is placed on the exposed top of an external wall to prevent seepage of water through joints of topmost course in a wall.
13. **Weathering:** Weathering is the sloping or bevelling of the top surface of stone to enable the rain water to flow off the surace.
14. **Throating:** It is the term applied to the cut underside of a projected course of masonry which is provided to

check the creepage of rain water on the underside of projected portion.

15. **Gable:** It is the triangular shaped portion of masonry at the end of sloped roof.
16. **Spalls:** When a larger block of stone is broken in pieces, the chips or small pieces which are used in filling the interstices in stone masonry, are termed as spalls.
17. **Template:** It is a block of stone which is used as bed plate with calculated dimensions under a beam or girder to distribute the loads over a greater bearing area under the beam or girder.
18. **Pier:** A vertical member built in stone or brick masonry to support beams, lintels and arches etc. is called Pier or **Pilaster**.
19. **Buttress:** Sometimes a pier is made monolithic with the walls to increase the stability of wall. So that it may be able to carry more loads. Sometimes pier is not extended to full height of wall and hence a slope is given from the broad section to reduced one which is called buttress.
20. **Corbel:** It is the extension of one or more courses of stone or brick from the face of wall which serves as a support for wall plates etc. It is built ornamental to give architectural beauty to the elevation.

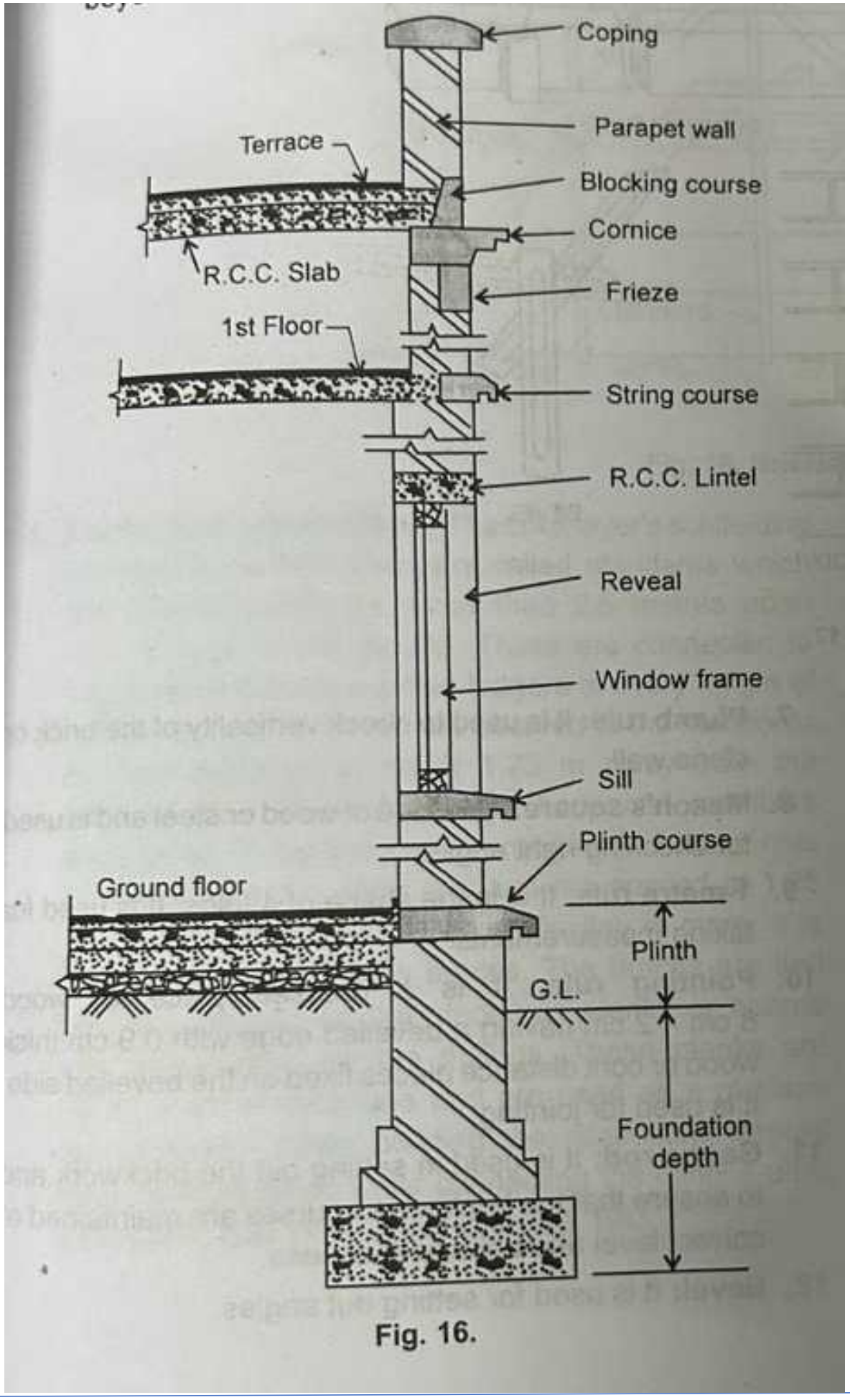

Coping
Parapet wall
Terrace
Blocking course
Cornice
R.C.C. Slab
Frieze
1st Floor
String course
R.C.C. Lintel
Reveal
Window frame
Sill
Plinth course
Ground floor
Plinth
G.L.
Foundation depth

Fig. 16.

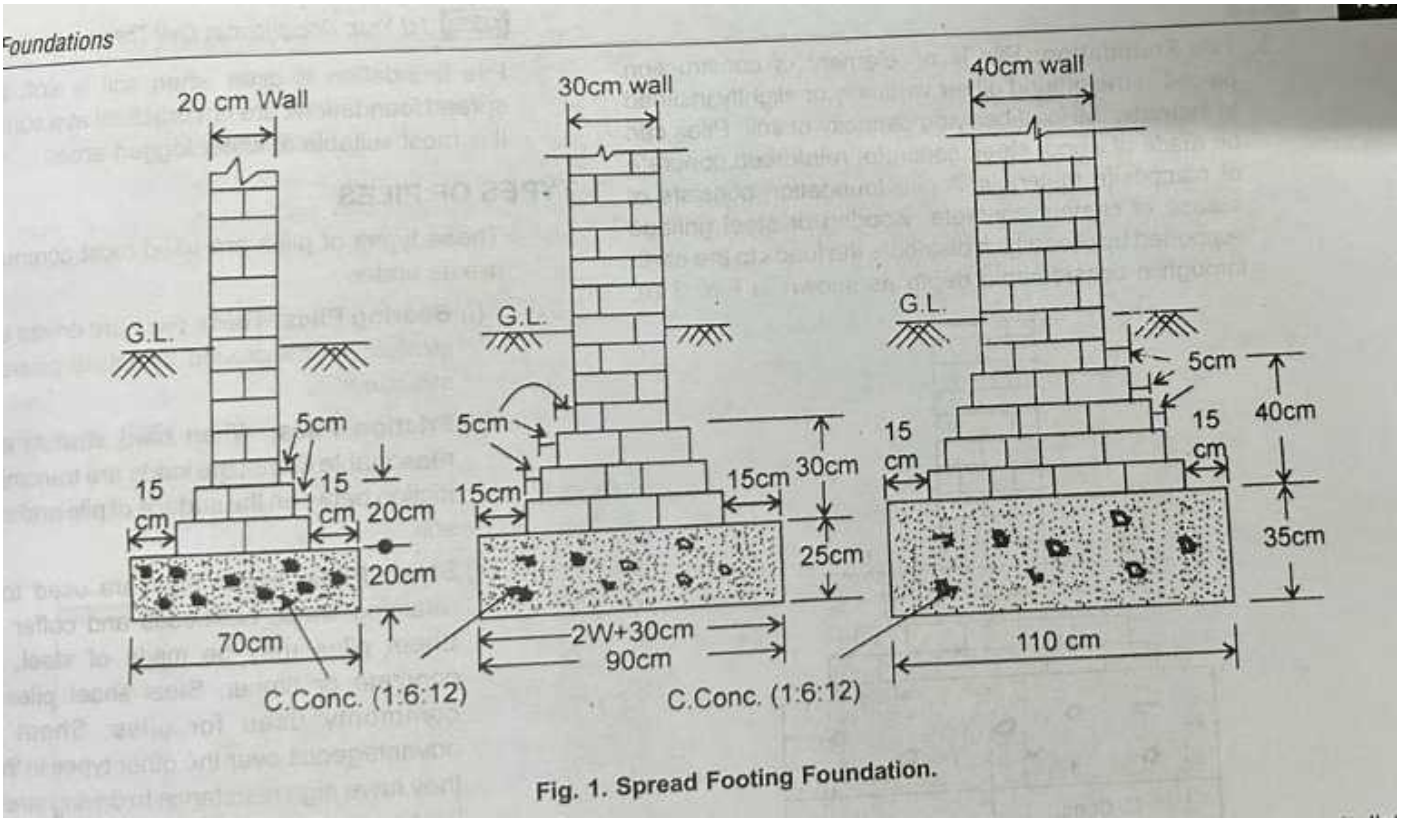
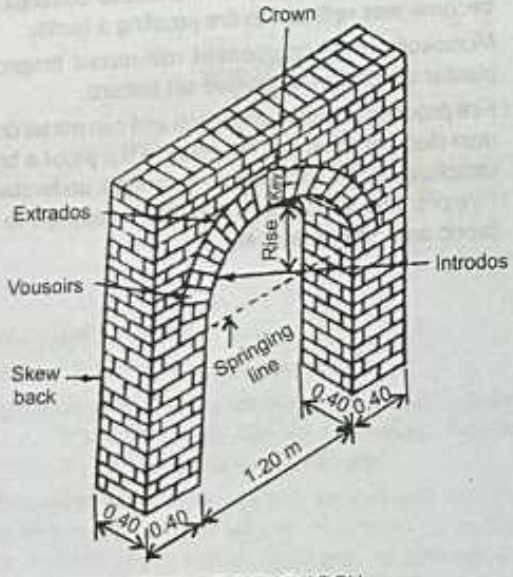


Fig. 1. Spread Footing Foundation.

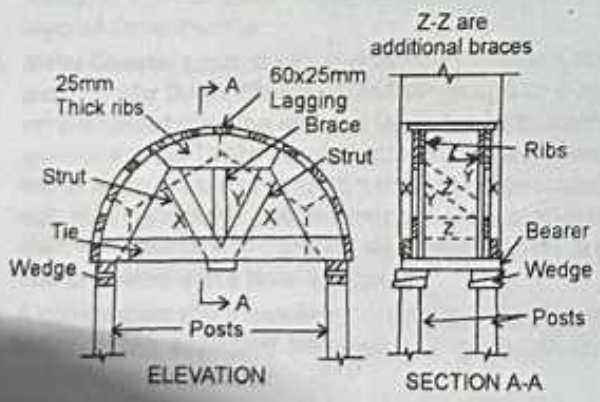
An arch is a structure, consisting of wedged-shape stones or bricks made to span over an opening to support the weight coming from above. These are in the form of a curve so as to resist the compressive stresses and to bind it mutually.

Terms used:

1. **SPAN:** This is the opening which is covered by the arch.
2. **ARCH RING:** This is the curved ring of masonry forming the arch.
3. **VOUSSOIR:** These are wedge shaped blocks of masonry of which the arch ring is made of.



SEMI-CIRCULAR ARCH



CENTERING FOR SEMI-CIRCULAR ARCH

4. **KEY STONE:** The central voussoir at the highest point of the arch.
5. **EXTRADOS:** The external curve of the arch.
6. **INTRADOS:** The inner curve of the arch.
7. **SOFFIT:** The inner and under-surface of the arch.
8. **CROWN :** The highest part of the extrados.
9. **ABUTMENT:** The portions of the walls which support the arch.
10. **SPRINGING POINT:** The points at the intersection between the skewbacks and the intrados.
11. **SKEW BACK:** These are the inclined or splayed surfaces of the abutments prepared to receive the arch and from which the arch springs.
12. **SPRINGING LINE:** The horizontal line joining the two springing points.
13. **HAUNCH:** The lower half of the arch between crown and skewback.
14. **SPRINGERS:** The lowest voussoir immediately adjacent to the skewback.
15. **RISE:** The vertical distance between the springing line and highest point of intrados.
16. **SPANDRILL:** Space between the back of the arch ring and a horizontal plane tangent to at the crown.

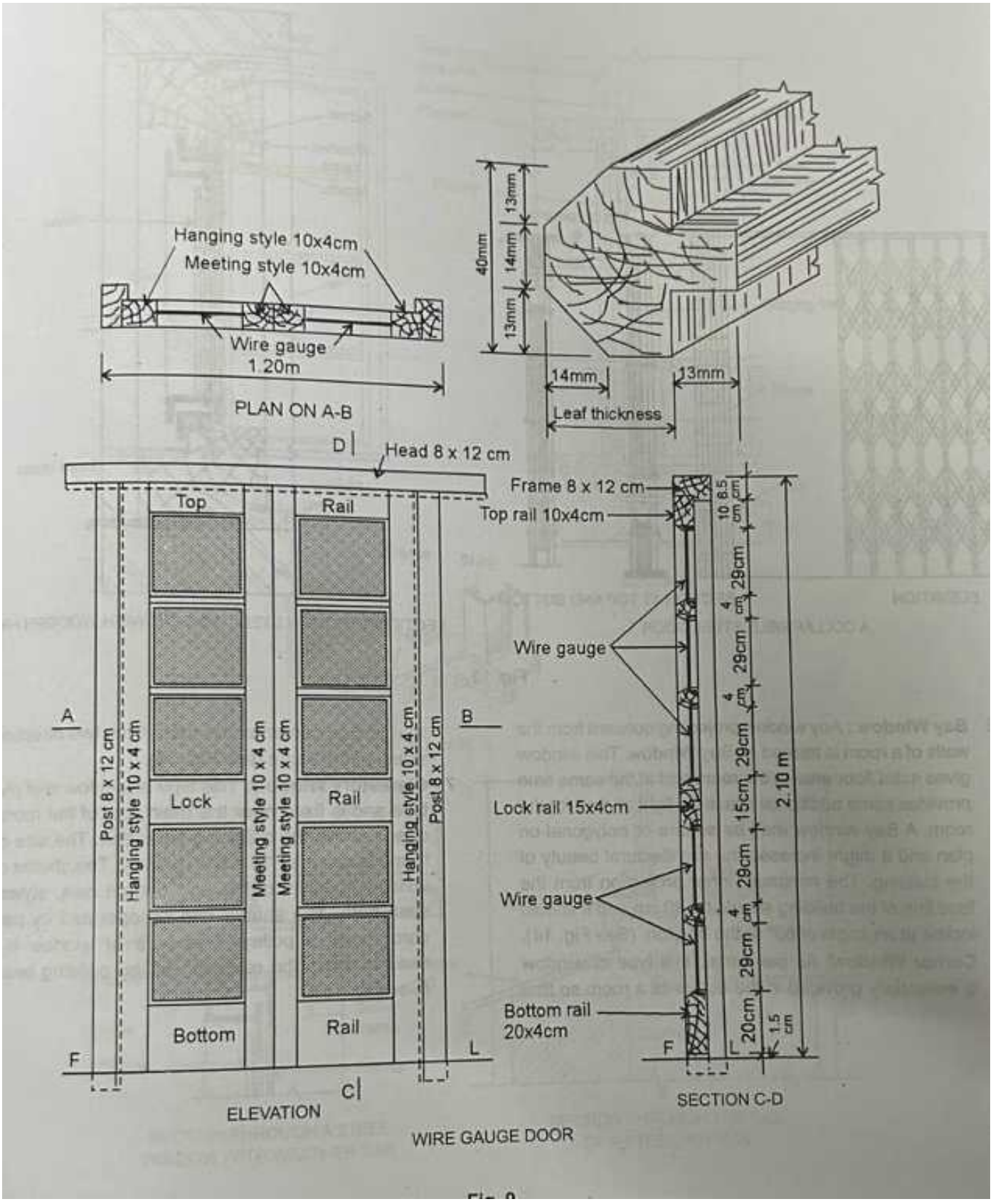
TYPES OF ARCHES

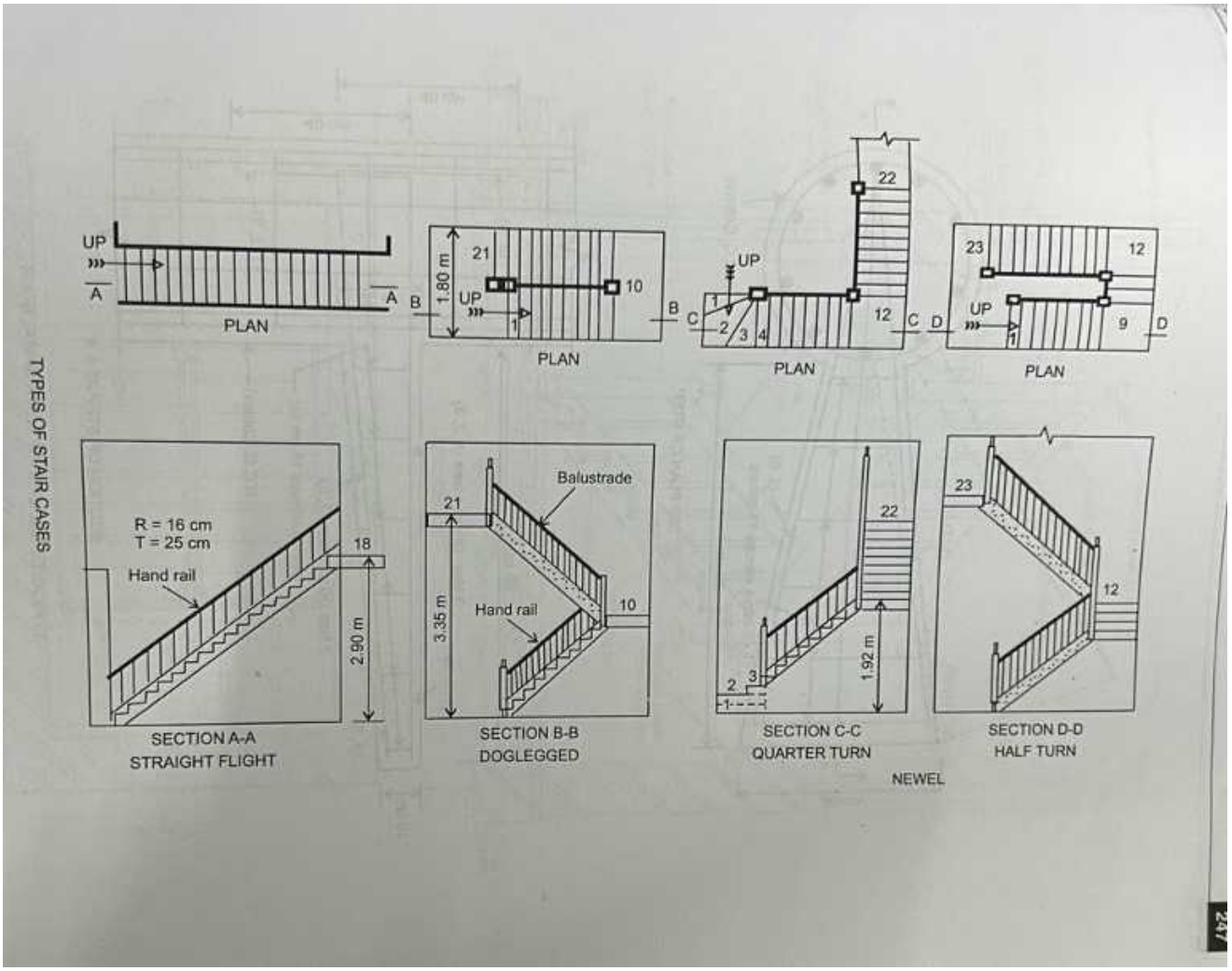
Semi-circular Arch: This type of arch is constructed on a centre, which is at the centre of the springing line. In this type of arch skew-backs are generally omitted. (Refer).

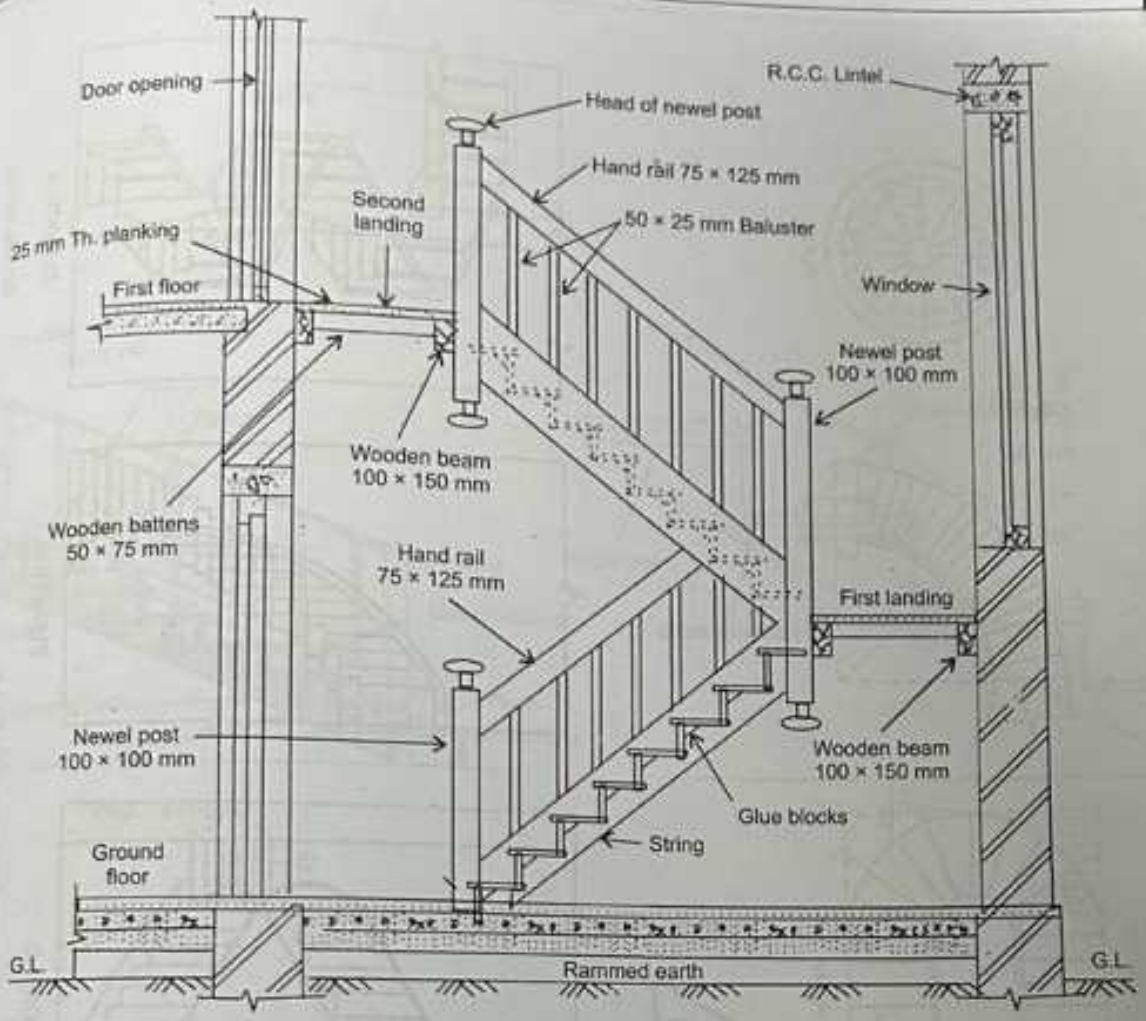
Segmental Arch: In segmental arches the bed joints of the voussoirs radiate from the centre which is below the springing line. Cross-joints may be omitted if desired. (Refer Fig. 1).

60° SEGMENTAL ARCH

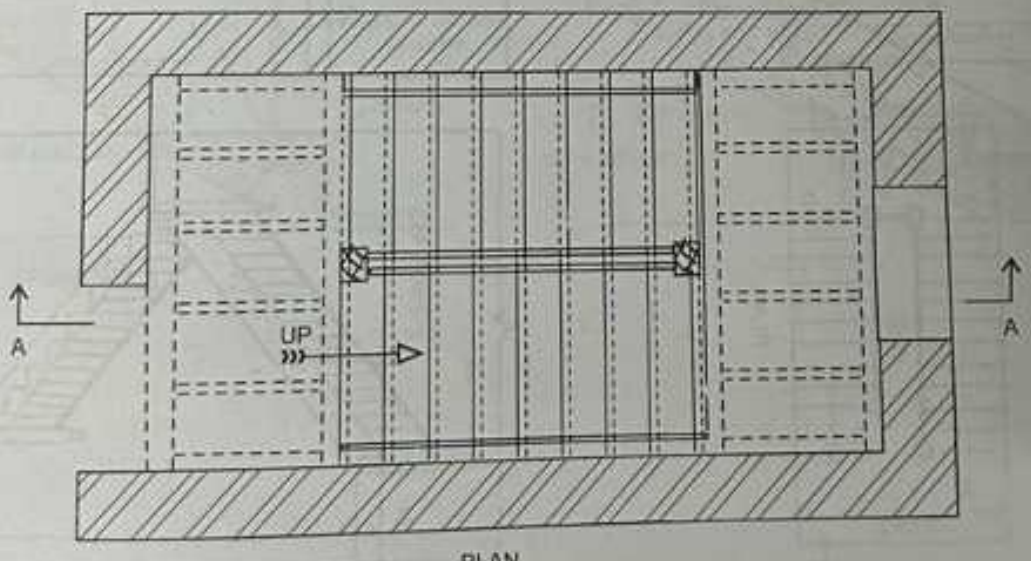
Fig. 1.


Hanging style 10x4cm
Meeting style 10x4cm
Wire gauge
1.20m
PLAN ON A-B
40mm
13mm
14mm
13mm
14mm
13mm
Leaf thickness
D
Head 8 x 12 cm
Top
Rail
Lock
Rail
Bottom
Rail
Post 8 x 12 cm
Hanging style 10 x 4 cm
Meeting style 10 x 4 cm
Meeting style 10 x 4 cm
Hanging style 10 x 4 cm
Post 8 x 12 cm
A
B
F
L
C
ELEVATION
Frame 8 x 12 cm
Top rail 10x4cm
Wire gauge
Lock rail 15x4cm
Wire gauge
Bottom rail
20x4cm
10
8.5 cm
29cm
4 cm
29cm
4 cm
29cm
15cm
29cm
4 cm
29cm
20cm
1.5 cm
2.10 m
F
SECTION C-D
WIRE GAUGE DOOR


TYPES OF STAIR CASES
UP
A
A
PLAN
B
1.80 m
21
10
UP
1
B
PLAN
22
UP
1
2
3
4
12
C
C
D
PLAN
23
12
UP
1
9
D
PLAN
R = 16 cm
T = 25 cm
Hand rail
18
2.90 m
SECTION A-A
STRAIGHT FLIGHT
Balustrade
21
3.35 m
Hand rail
10
SECTION B-B
DOGLEGGED
22
2
3
1.92 m
SECTION C-C
QUARTER TURN
23
12
SECTION D-D
HALF TURN
NEWEL

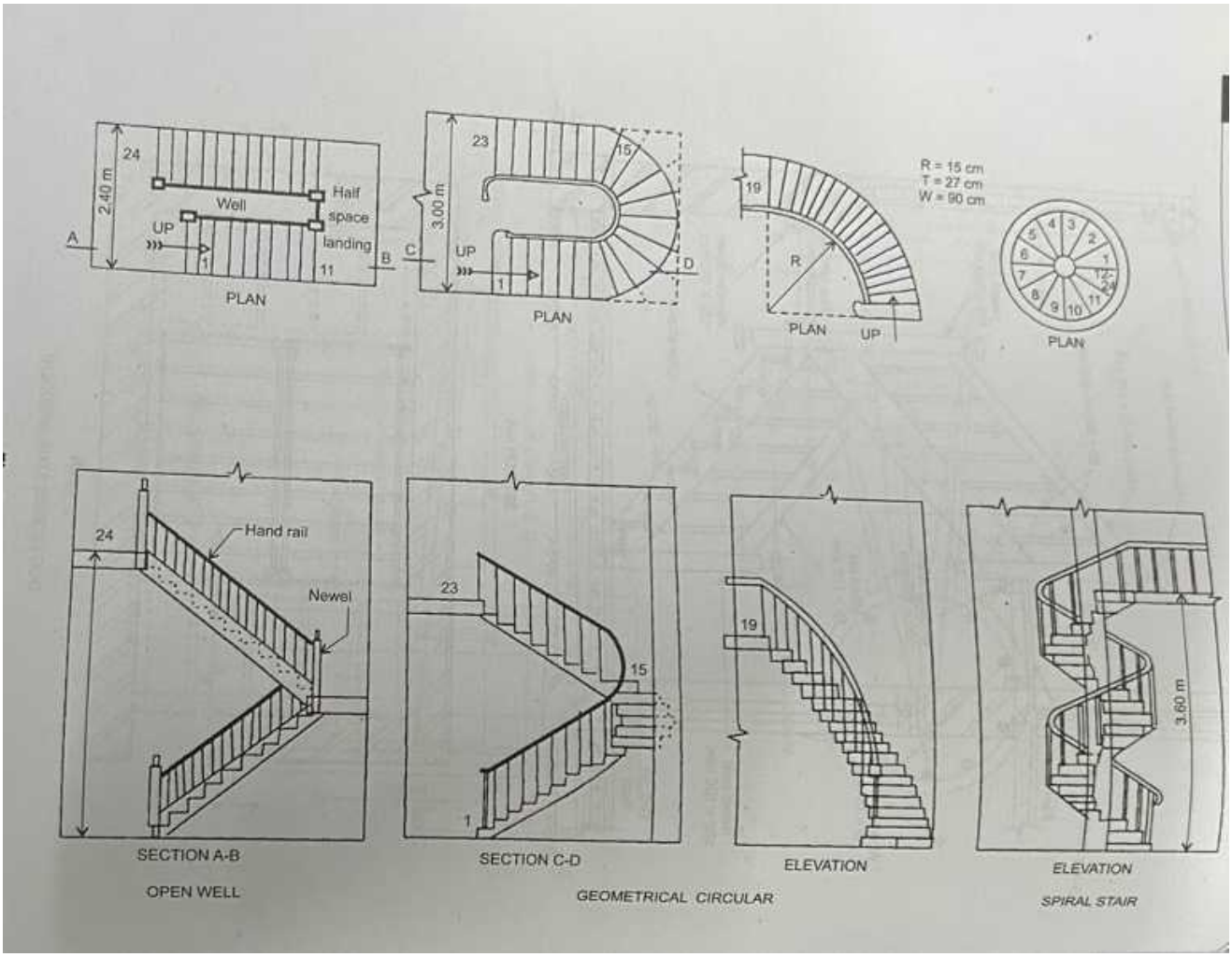


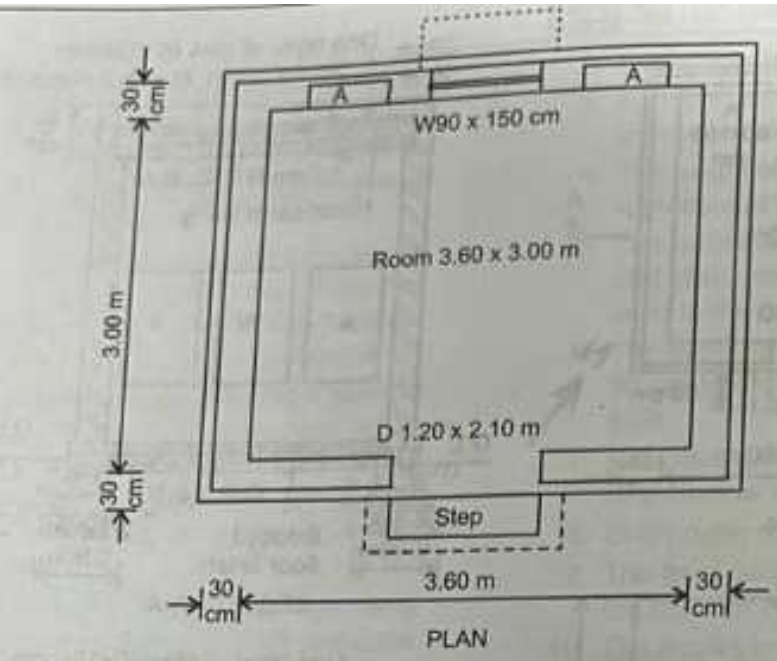
SECTION A-A

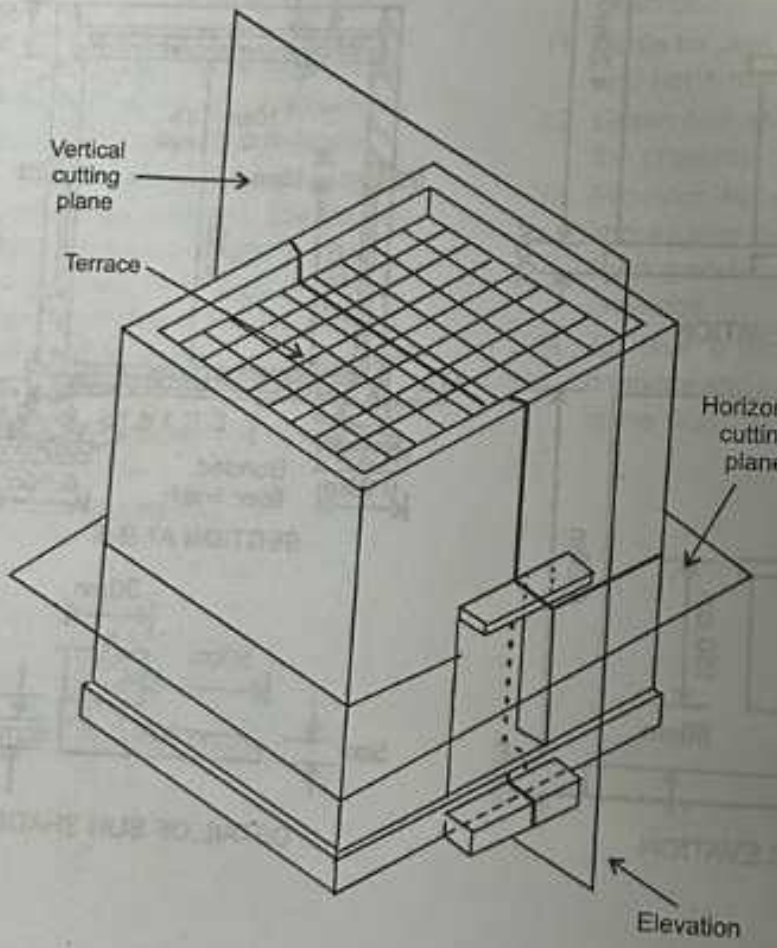


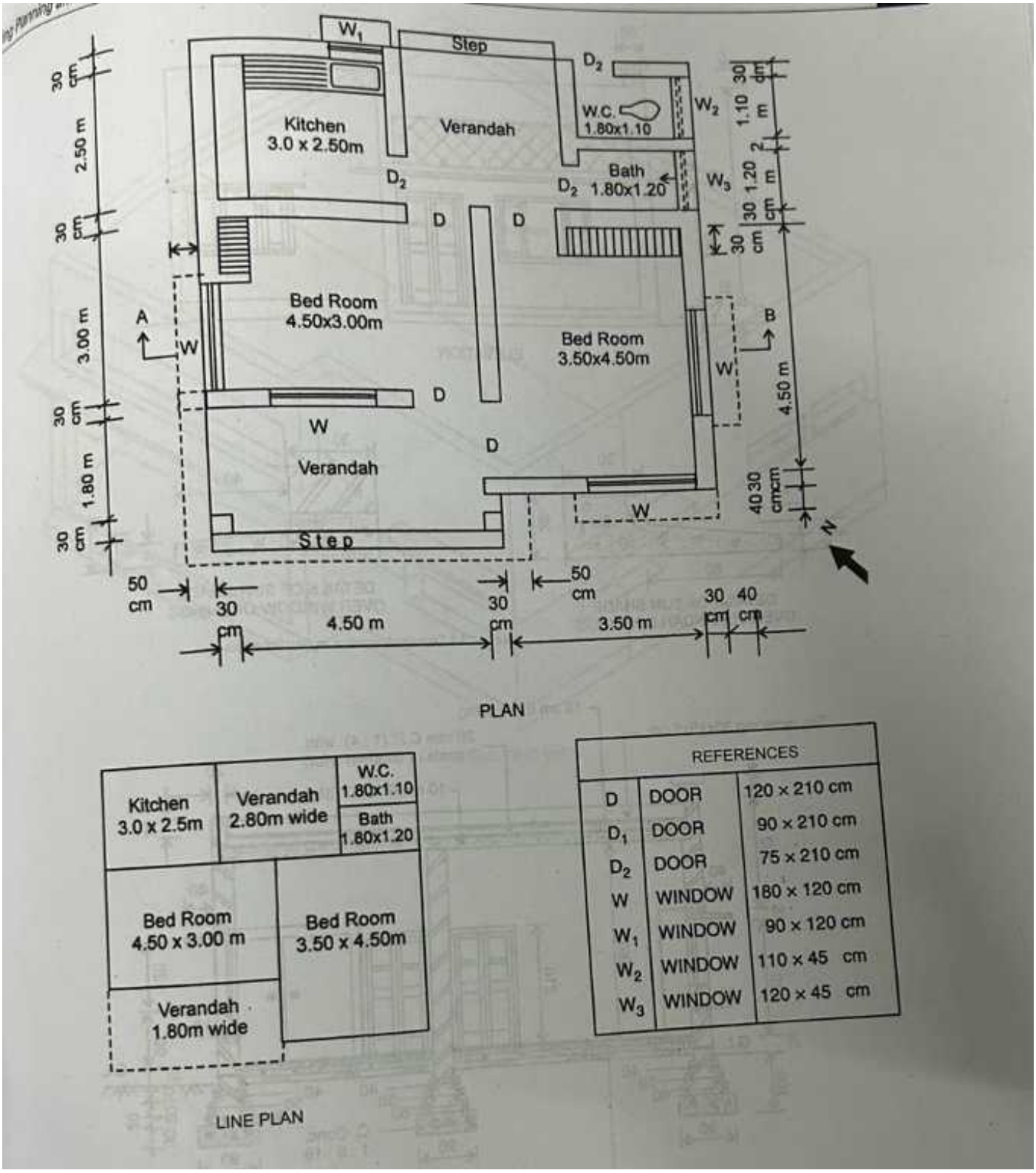
PLAN

DOG LEGGED STAIR (WOODEN)


24
2.40 m
Well
Half
space
landing
UP
A
B
1
11
PLAN
23
3.00 m
15
C
D
UP
1
PLAN
19
R
PLAN
UP
R = 15 cm
T = 27 cm
W = 90 cm
PLAN
24
Hand rail
Newel
SECTION A-B
OPEN WELL
23
15
1
SECTION C-D
19
ELEVATION
3.60 m
ELEVATION
GEOMETRICAL CIRCULAR
SPIRAL STAIR


30 cm
A
A
W90 x 150 cm
Room 3.60 x 3.00 m
3.00 m
D 1.20 x 2.10 m
30 cm
Step
30 cm
3.60 m
30 cm
PLAN


Vertical cutting plane
Terrace
Horizontal cutting plane
Elevation



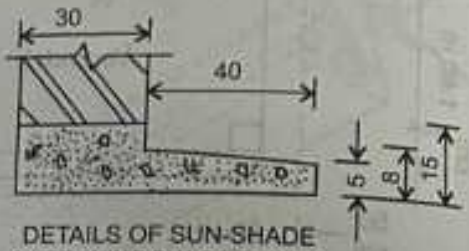
PLAN

LINE PLAN

REFERENCES		
D	DOOR	120 × 210 cm
D_1	DOOR	90 × 210 cm
D_2	DOOR	75 × 210 cm
W	WINDOW	180 × 120 cm
W_1	WINDOW	90 × 120 cm
W_2	WINDOW	110 × 45 cm
W_3	WINDOW	120 × 45 cm

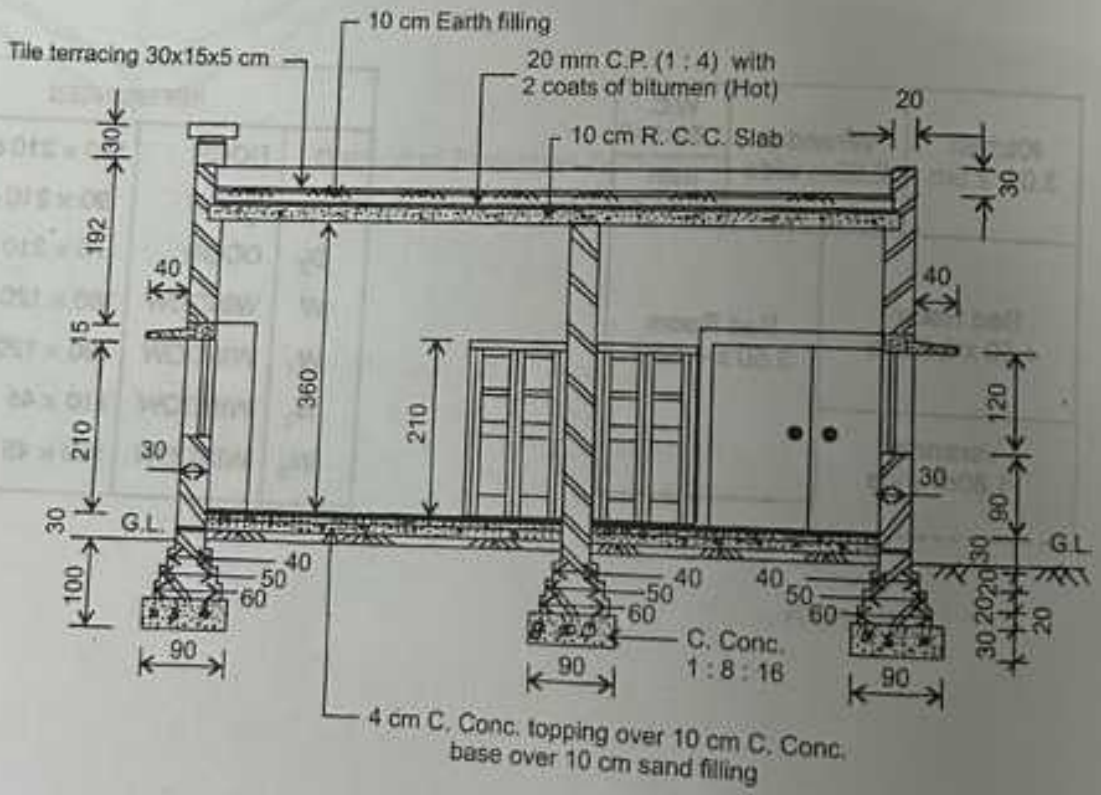
ELEVATION

DETAILS OF SUN-SHADE
OVER VERANDAH OPENINGS

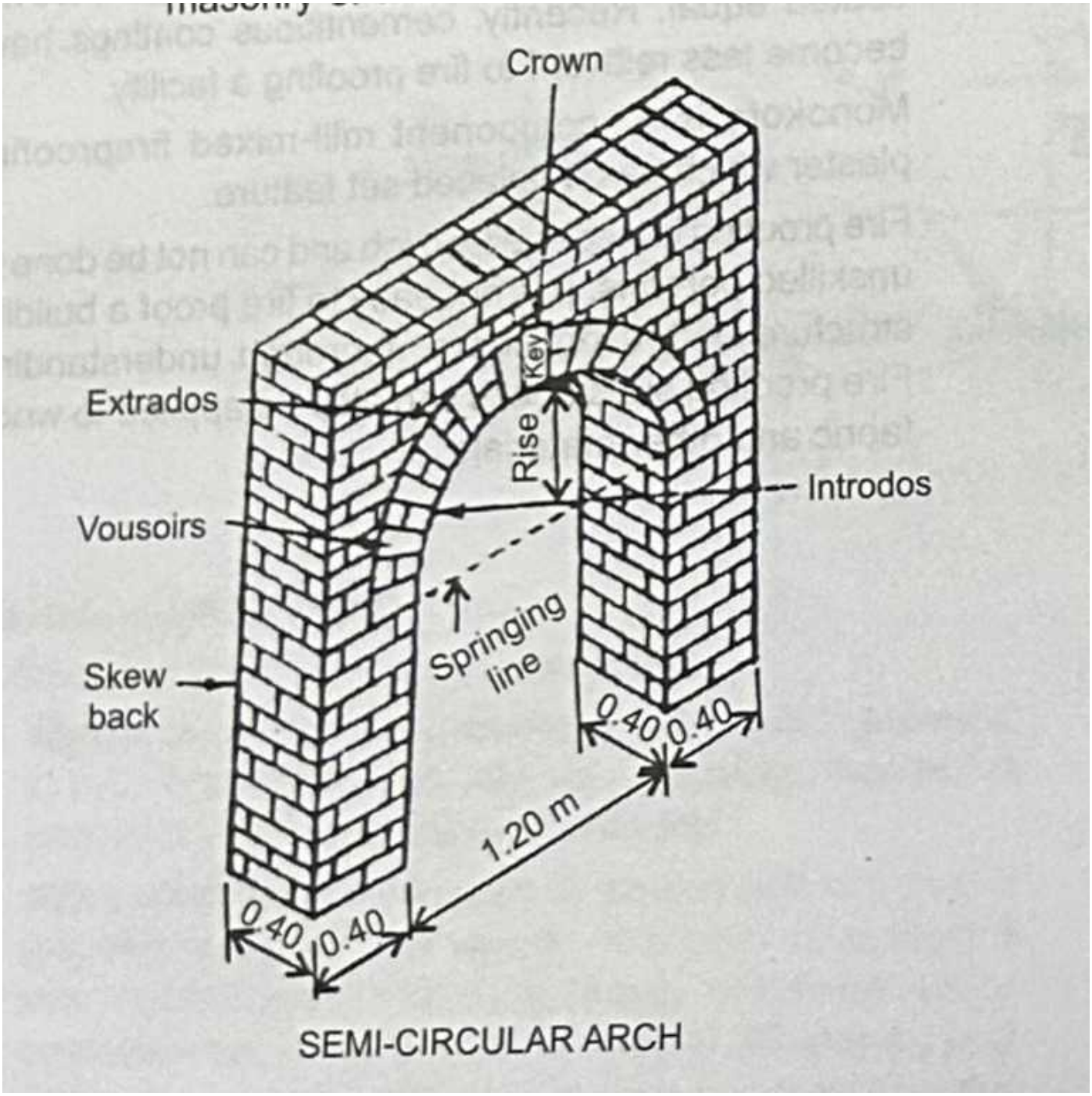


DETAILS OF SUN-SHADE
OVER WINDOW OPENINGS

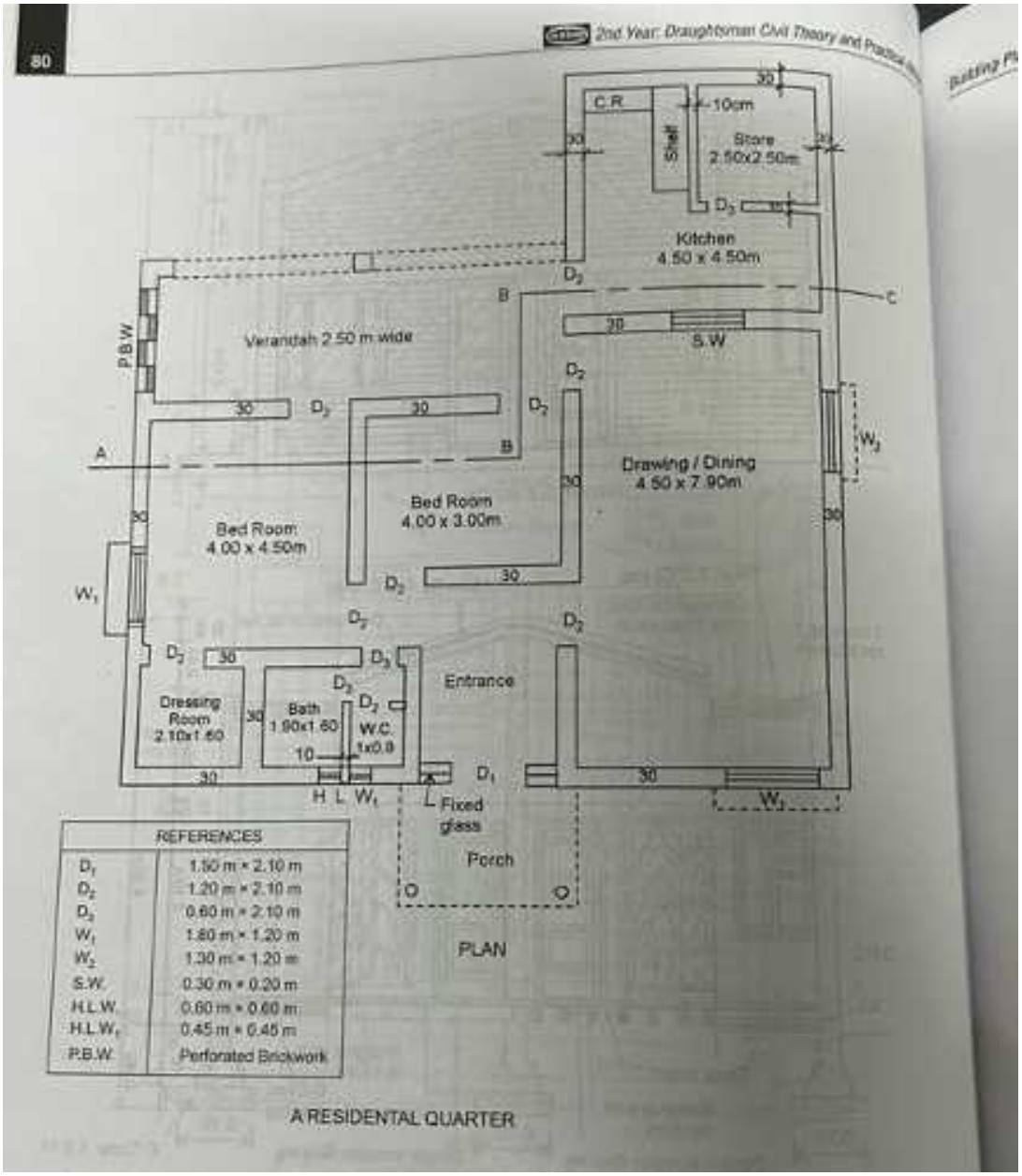
Note : All Dimensions are in centimetres



SECTION A-A



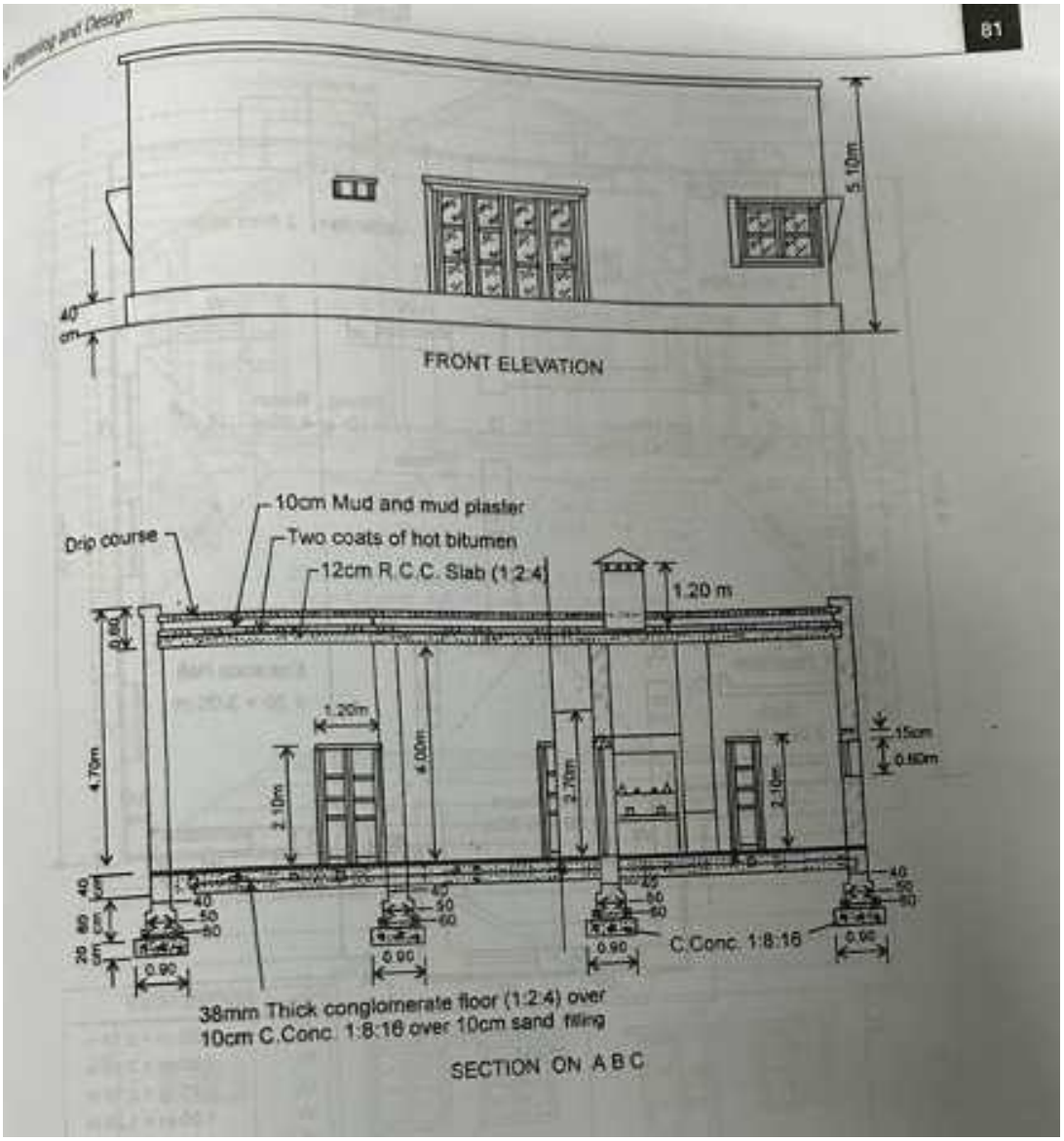
SEMI-CIRCULAR ARCH



REFERENCES	
D_1	1.50 m × 2.10 m
D_2	1.20 m × 2.10 m
D_3	0.60 m × 2.10 m
W_1	1.80 m × 1.20 m
W_2	1.30 m × 1.20 m
S.W.	0.30 m × 0.20 m
H.L.W.	0.60 m × 0.60 m
H.L.W_1	0.45 m × 0.45 m
P.B.W.	Perforated Brickwork

PLAN

A RESIDENTAL QUARTER


5.10m
40 cm
FRONT ELEVATION
10cm Mud and mud plaster
Drip course
Two coats of hot bitumen
12cm R.C.C. Slab (1:2:4)
1.20 m
0.60
4.70m
1.20m
2.10m
4.00m
2.70m
2.10m
15cm
0.60m
40 cm
0.90
C.Conc. 1:8:16
38mm Thick conglomerate floor (1:2:4) over
10cm C.Conc. 1:8:16 over 10cm sand filling
SECTION ON A B C

UNIVERSITY QUESTION PAPER FOR REFERENCE

Reg. No. :

Question Paper Code : 70025

B.Arch. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022

Second Semester

AR3221 – BUILDING COMPONENTS AND THEIR REPRESENTATION

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions

PART A — (10 × 2 = 20 marks)

1. What is the difference between framed structure and load bearing structure?
2. Draw the cross of a stone foundation and lable it
3. Draw the representation of the following
   (a) Brick
   (b) wood
   (c) stone
   (d) concrete
4. Distinguish building materials and building components.
5. Draw the plan and elevation of point P 30 mm in front of V.P. and 45mm below the H.P.
6. What is a coping stone and cornice? Give a sketch of each.
7. Draw the isometric projection of a cuboid 5cm × 5cm × 8cm.
8. Define Vanishing points?
9. State the importance of measured drawing in building documentation.
10. How would you measure the diameter of a circular column in a building?

PART B — (4 × 20 = 80 marks)

11. (a) Write short notes on the following

(i) Space structure (5)

(ii) Vaulted roofing system (5)

(iii) Weather proofing (5)

(iv) Foundations (5)

Or

(b) Draw the cross section through wall of a load bearing structure and represent the layers of structural system (Foundation, window, roof and parapet) in a suitable scale. Mark the dimensions and label the different levels.

12. (a) Draw the orthographic projections and isometric projection of a entrance stair of width 200cm having 5 steps. Tread-30cm, Riser-15cm in a suitable scale. Give all the dimensions and indicate the direction of viewing.

Or

(b) Draw the orthographic projections and isometric projection of a Tea poy (wooden) of size 1.2m × 1m × 0.8m. Assume suitable dimensions of the supporting member and use appropriate scale. Give all the dimesions and indicate the direction of viewing.

13. (a) Draw the plan and interior perspective of a classroom of size 6m × 4m × 3.5m to accommodate 20 students. (assume the necessary details)

(i) Plan showing furniture layout to a suitable scale. (10)

(ii) Interior perspective. (10)

Or

(b) Draw the perspective view of a semi-circular arched opening in a wall having the length of 3m, thickness 0.4m and height 3.5m. The opening is 1.5m wide and the springing points are at a height of 2.1m. The wall makes an angle of 45° with the picture plane. Select a suitable position of the spectator. Give all the dimensions and indicate the direction of viewing.

14. (a) Discuss in detail through neat sketches the steps to be considered in documentation of a historic building in total using measured drawing.

Or

(b) Discuss in detail the tools and methods used in the documentation of a contemporary building in total using measured drawing.

Reg. No. :

Question Paper Code : 60014

B. Arch. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Second Semester

AR3221 – BUILDING COMPONENTS AND THEIR REPRESENTATION

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the various enclosures of a building.
2. Differentiate vault and dome.
3. Draw any furniture in an orthographic view.
4. Draw any building element in an isometric view.
5. How do you sketch a shikara of a temple? What are the elements you will focus in your representational diagram?
6. What are the various types of sunshades?
7. Brief about stringcourse.
8. Name the paving which helps water percolation into the ground.
9. Represent four different materials through rendering
10. List down the different spaces where ventilators are used.

PART B — (4 × 20 = 80 marks)

11. (a) Describe the basic materials for construction of a staircase.

Or

(b) Explain the different type of roofs and the difference of construction.

12. (a) Write your understanding on scaling of building components.

Or

(b) Represent through hatches any fifteen different building materials inside a 2cm × 2cm box.

13. (a) Describe the contribution of representational drawing in understanding historic buildings.

Or

(b) What is the different aspects to be considered during drawing of a historic building?

14. (a) Differentiate the significance of proportionate sketches with measured drawing.

Or

(b) List down the various aspects to be considered during drawing of a contemporary building with sketches.