

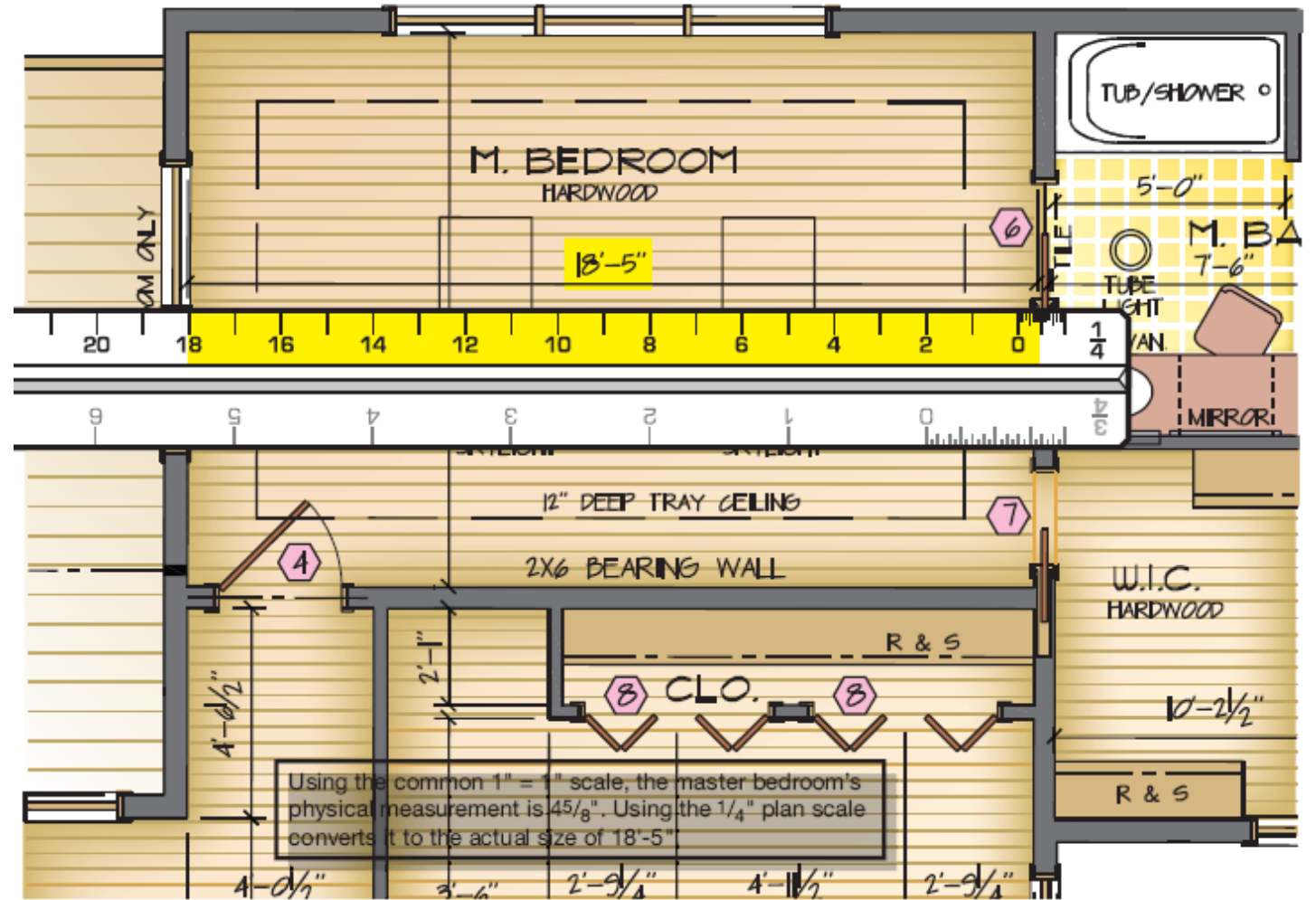
LECTURE OUTLINES

Introduction

- Architecture
- Architectural working drawing
- Components of working drawing

Building systems/Elements

- Substructures
- superstructures



INTRODUCTION

Architecture

What?, Why?, How?

1. What is Architecture?

Architecture is the art and or science of buildings.

The art and science of **designing** and **building structures, communities**, or open areas, in keeping with aesthetic and functional criteria.

WHY DO WE NEED ARCHITECTURE?



CONT'D

The fire is the focus, and also a place to cook. A windshield protects the fire from too much breeze, and as a wall begins to give some privacy. There is a place where the fuel for the fire is kept, and the back of the car acts as a food store. There are places to sit, and if one were to stay overnight, one would need a bed.

These are the basic ‘**places**’ of a house; they come before walls and a roof.

Conception of **Space** before **Form**

ARCHITECTURE; HOW,

Architecture is generally conceived-designed-and realized-built-In **response to an existing set *of* conditions.**

These *conditions* may *be* purely **functional in nature**, or they may also reflect in varying *degrees* the, **social, political,** and **economic** situation and the **natural** climate.

In any case it is assumed that the existing set of **conditions-the, problem-is Less than satisfactory** and that a new set of **conditions-a solution-would be desirable.**

The act of creating architecture, then, is a **problem-solving or design process.**

BUILDING PROCESSES

Phases of the Building Process

- **Pre Construction Phase**

- Development of plans, Specification, Financing, Budgets and Permits

- **Initial Construction Phase**

- Building the foundation, framing floors, walls and roof
- Installing windows, doors, exterior walls, and roof coverings

- **Finishes Phase**

- Interior Components are installed in this phase
- Mechanical systems installed: plumbing, electrical, and HVAC
- Interior finishes applied: walls, flooring, ceilings, fixtures, appliances, and cabinets
- Exterior Landscaping plantings, drives, walks

- **Post Construction Phase**

- Final finishing touches, completion inspections, and establish a move-in date

2. WORKING DRAWINGS

Working drawings are the main **construction documents** which are used to show the overall **configuration of the building**.

Working drawings are produced after the building is designed. They are a set of drawings including **detailed plans**, sections, & **elevations** of a building.

- When we come to the manufacturing process of **goods**, the final representation of that **equipment** before **manufacturing** is called working drawing.
- So, in general, working drawings are sets of drawings of **buildings**, **equipment**, **goods** ...showing **dimensions**, material **specifications** & other necessary description.

WHY WORKING DRAWINGS...

The function provided by **working drawing** during the realization of the project;

1. **Communicate technical information throughout the building team.**
2. To show how the design is going to be realized.
3. **Convey information for people concerned in erecting the building**
4. Give information to specification writer.
5. **For instructing the contractors and others members of the building team.**
6. Illustrate construction detail.

WHY WORKING DRAWINGS

- 7. Means of obtaining official approval
- 8. Helps in the analysis of cost factor
- 9. Establish use of materials
- 10. Provides detail for tendering
- 11. Indicate contractual commitment
- 12. Indicate degree of supervision
- 13. Demonstrate construction detailing

REQUIREMENTS OF WORKING DRAWINGS

➤ Working drawing should be: -

- Clearly representative.
- Easily understood.
- Comprehensive.
- Free from unnecessary notes (Repetitive detail)
- Accurately drawn (proper in line work)
- Drawn with appropriate symbols and proper convention.
- Dimensioned well.
- Drawn by referring building code.
- Proper in graphical representation.
- Proper title. (Information panel)
- Logical and neatly arranged to give a balanced layout on the sheet paper.
- Drawn in appropriate scale

COMPONENTS OF ARCH.WORKING DRAWING

□ The finished drawings made by the architect which used by the contractor that working drawings includes the following sheets.

1. Title Block and sheet

2. Floor plans

3. Elevations

4. Sections

5. Roof plan

6. Site plan

7. Reflected ceiling plan

8. Foundation plan

9. Schedules

□ Structural working drawing components

1. Title page and index

2. Foundation plans

3. Footing and column layout plan

4. Beam layout plan

5. Slab layout plan

6. Beam details

7. Column details

8. stair

Title Block and Sheet

- Detail 10-1**

Sample Title Block

Title Block & Sheet (contd...)

Light Stream Consulting Architects & Engineers					
2. Kind of Project	Project Residential Building				
3. Name of the owner	Owner Dr. Kassahun Lemma				
4. Location of the site	Location Addis Ababa Kolfe Keranio Sub City Keb. 06 H.No new				
5. Name of the drawings on the paper	Drawing Title Floor Plans, Elevation, Site Plan				
6. Scale of each drawings	Scale 1:50, 1:200		Drawn by Samuel Daniel		
7. Info. about the Designer	Designed By Dawit Sileshi PAR 175 Sig. Tel.		Approved By Moges Hailu PPAR 035 Sig. Tel.		
	Paper Size A1				AR 01/05
	Date June 20, 2008				

10. Drawing Paper Size

11. Date

3. BUILDING SYSTEMS (ELEMENTS)

- **What is a system?**

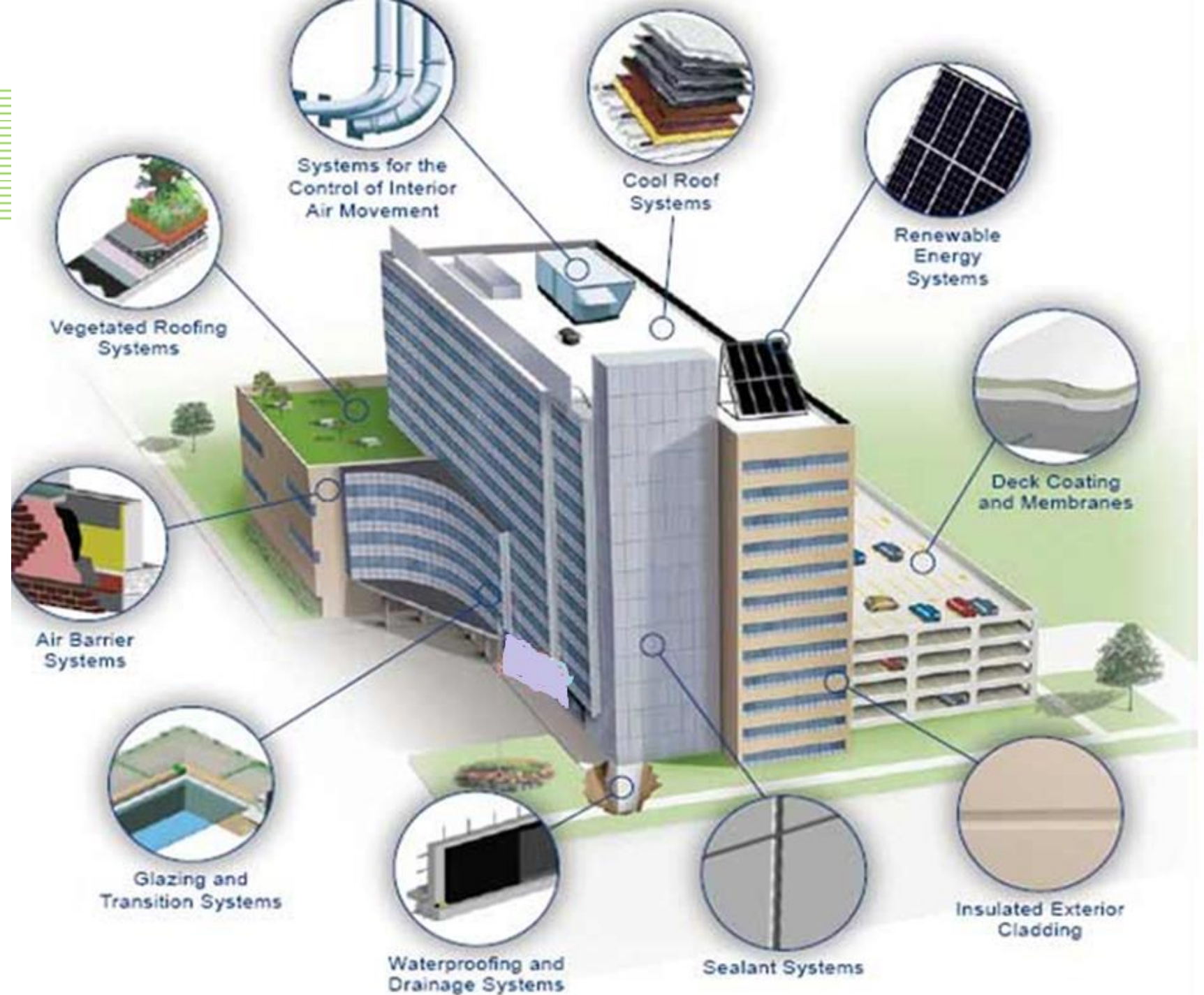
A system is a regularly interacting or interdependent group of items forming a unified whole.

- **What are building systems?**

Building systems are all components of the building which give the building stability, enclosure, heat, ventilation & other services.

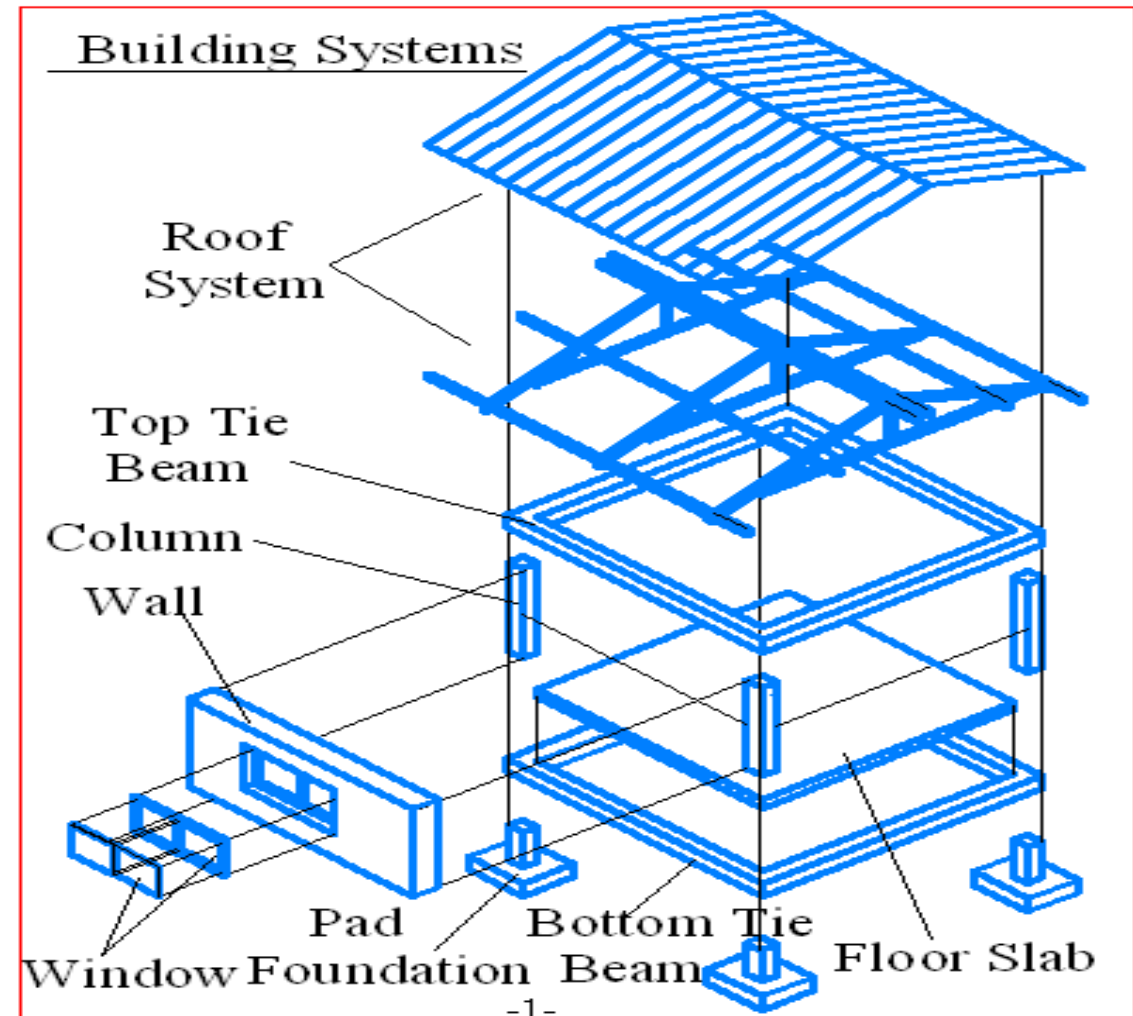
CONT'D

Any building consist of **elements** which could either be **structural** or non **structural**.



CONT'D

- The building system element consist of **parts** and **physical** components held together in a **rigid structural** framework.
- The building system can be broken down physically into tw major building structural components:
 - a) Sub-structure
 - b) Super-structure



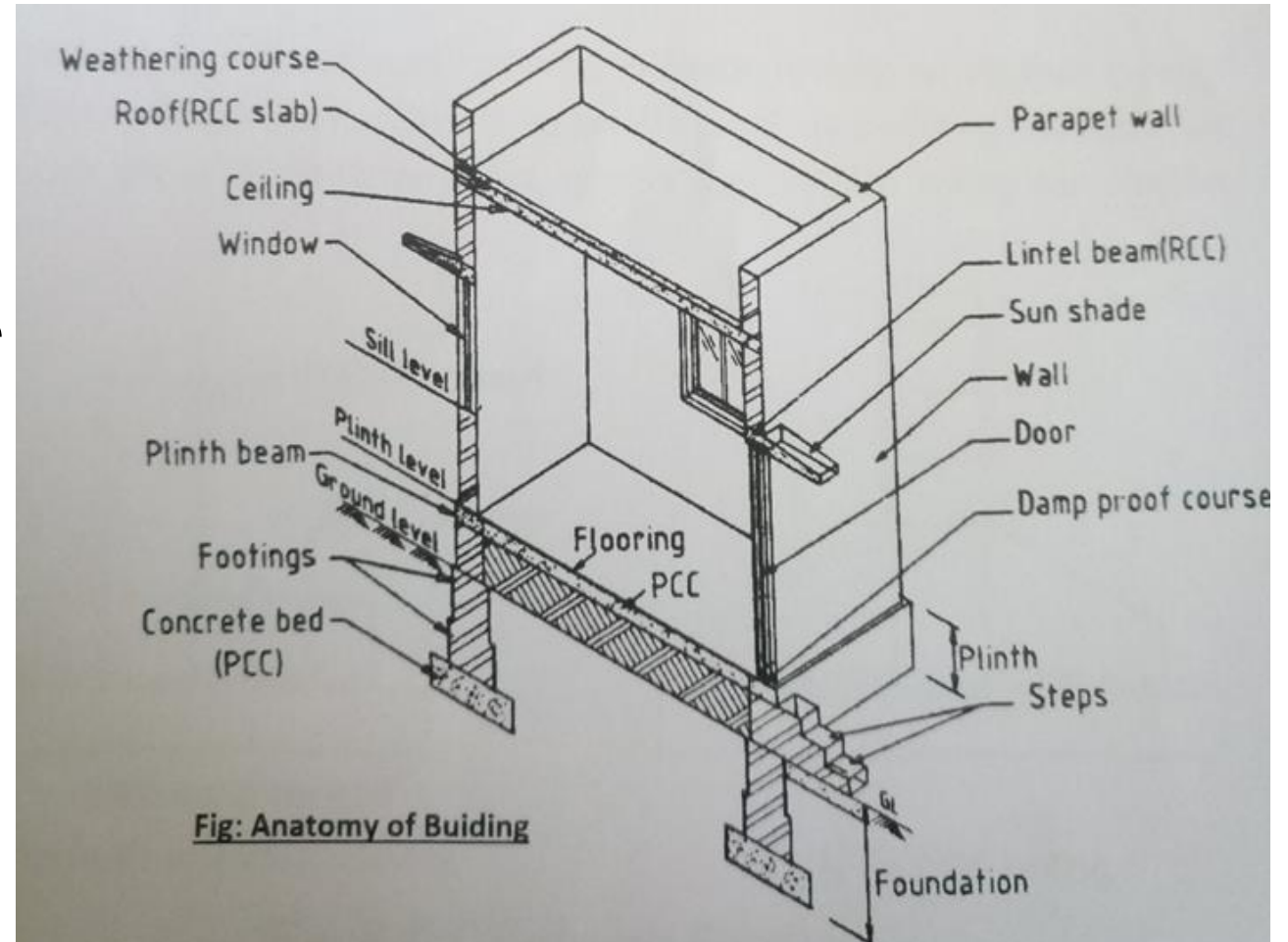
CONT'D

Sub-structure elements

Is the building part inside the earth surfaces which is the basic foundation of the building.

Super-structure elements

Is the part of the building located or constructed above the ground level.



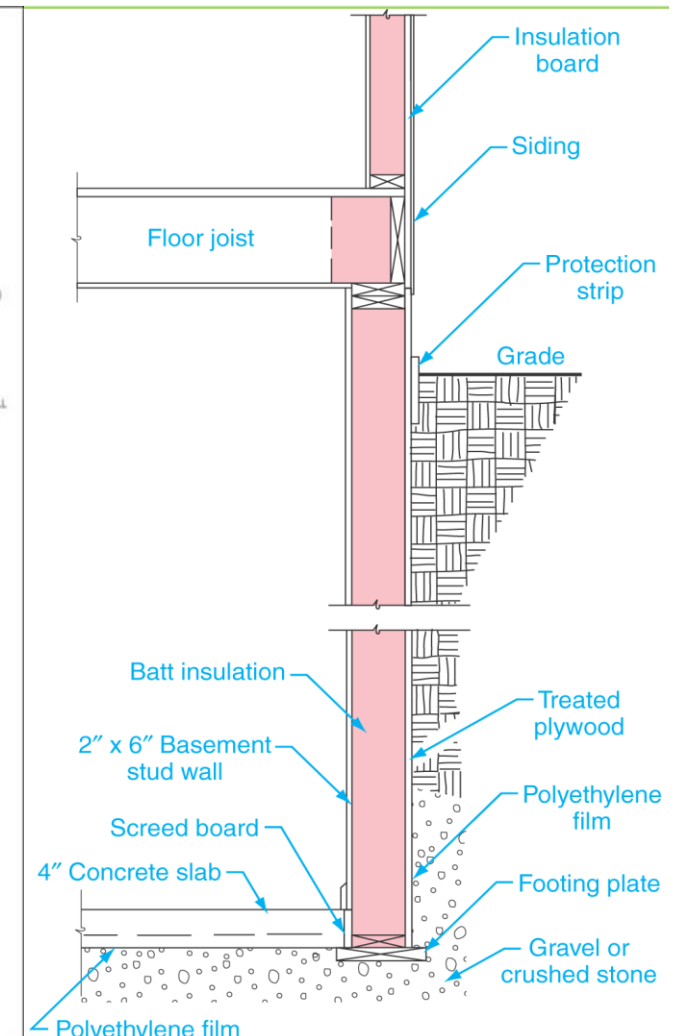
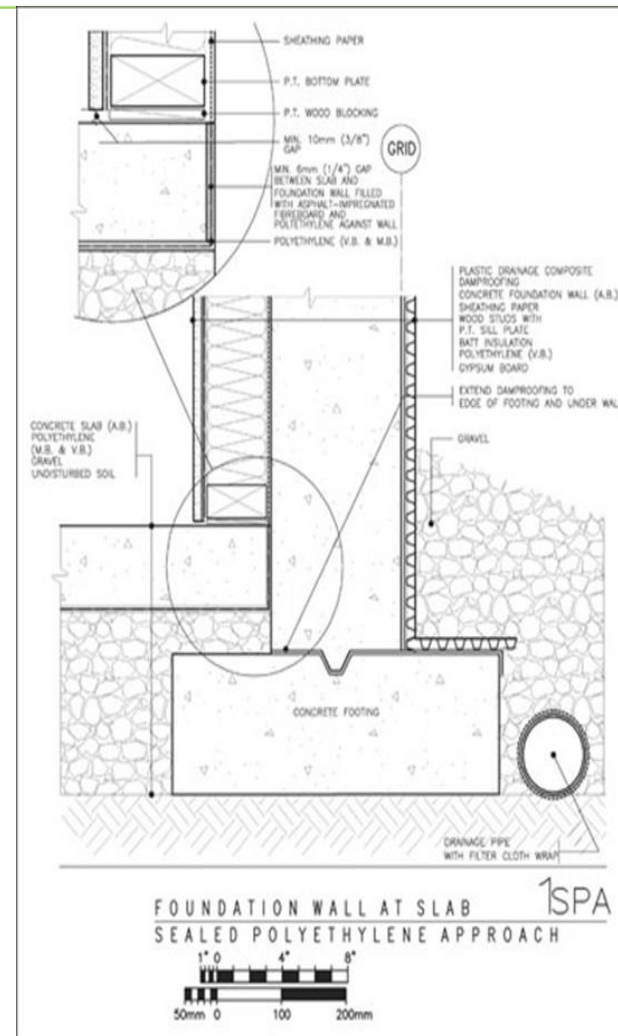
CONT'D

Sub-structure elements

Is the building part inside the earth surfaces which is the basic foundation of the building. It includes p.c.c bed, foundation footing and wall, column footing based on the foundation type.

Super-structure elements

Is the part of the building located or constructed above the ground level. The super structure of the building anatomy includes; plinth wall, plinth beam, wall floor to roof.



SUB- STRUCTURES

1. FOOTING

Footings increase supporting capacity of the foundation wall.

Most houses **require footings**.

Soil **bearing capacity** and **weight of house** determine the **size** and type of **footing**.

Footings are generally **poured concrete**.

Footing size is typically based on the **foundation wall thickness**.



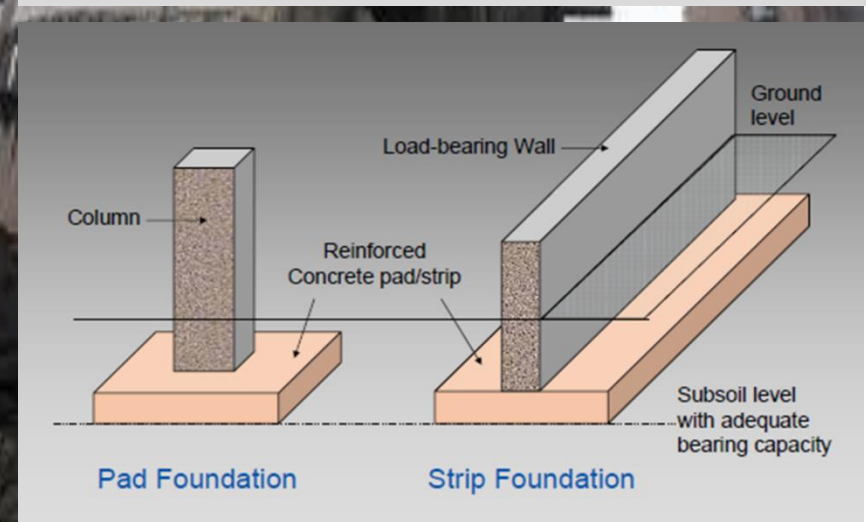
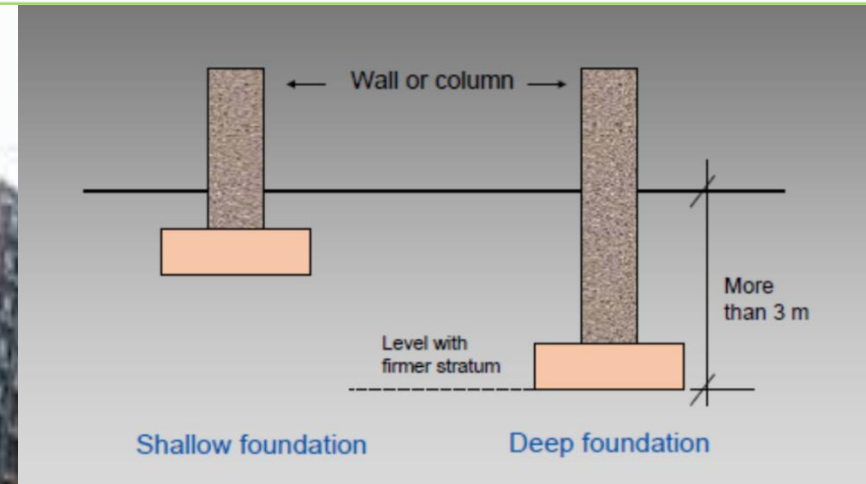
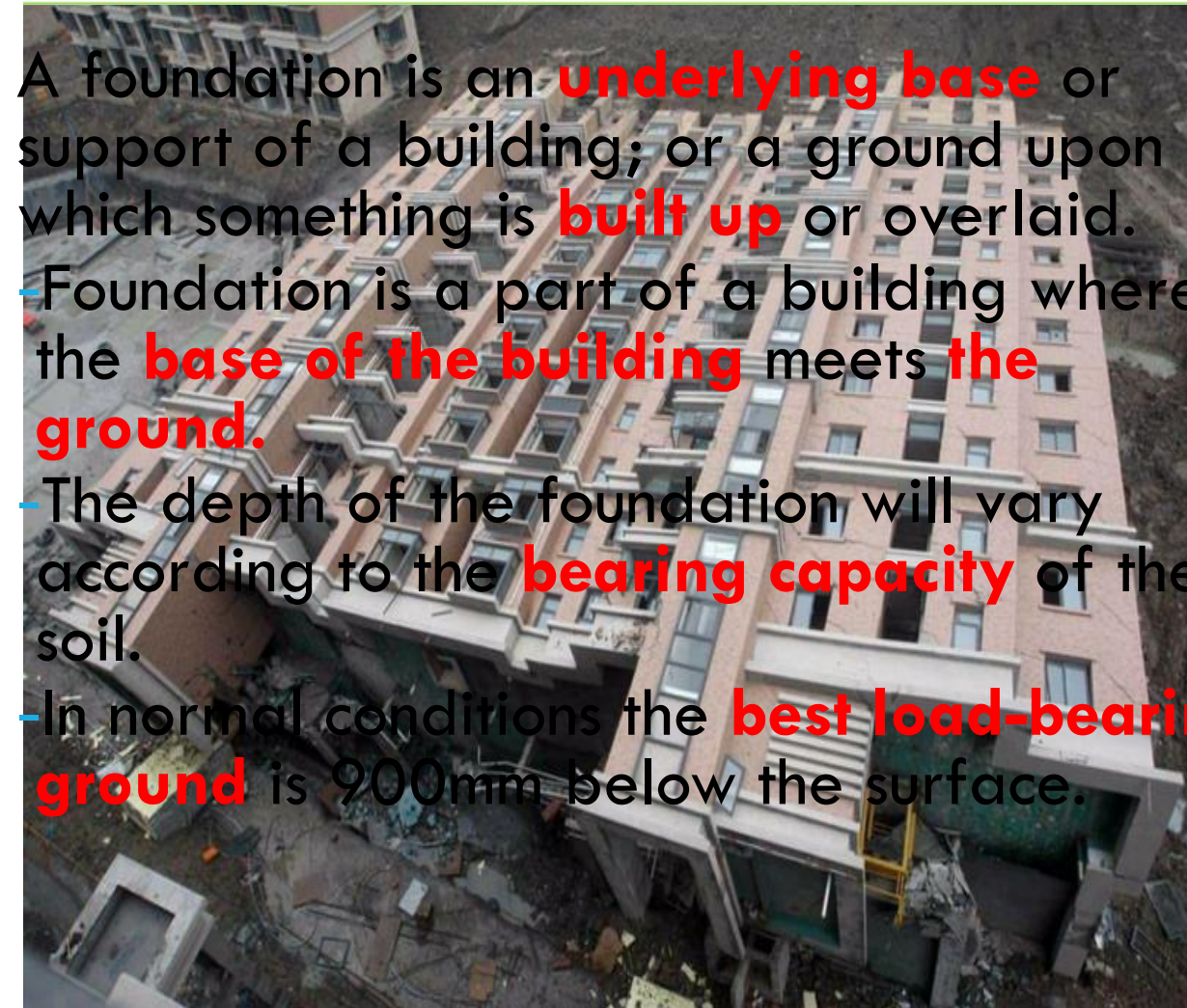
2. FOUNDATION

A foundation is an **underlying base** or support of a building; or a ground upon which something is **built up** or overlaid.

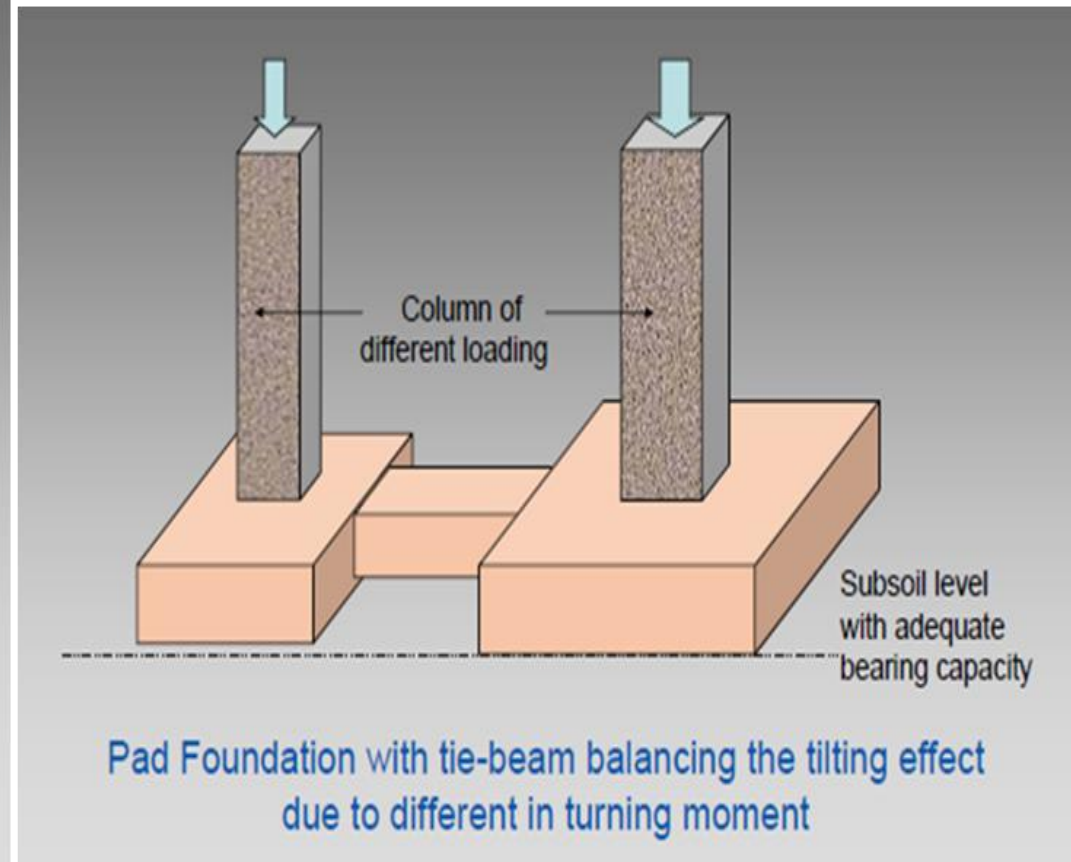
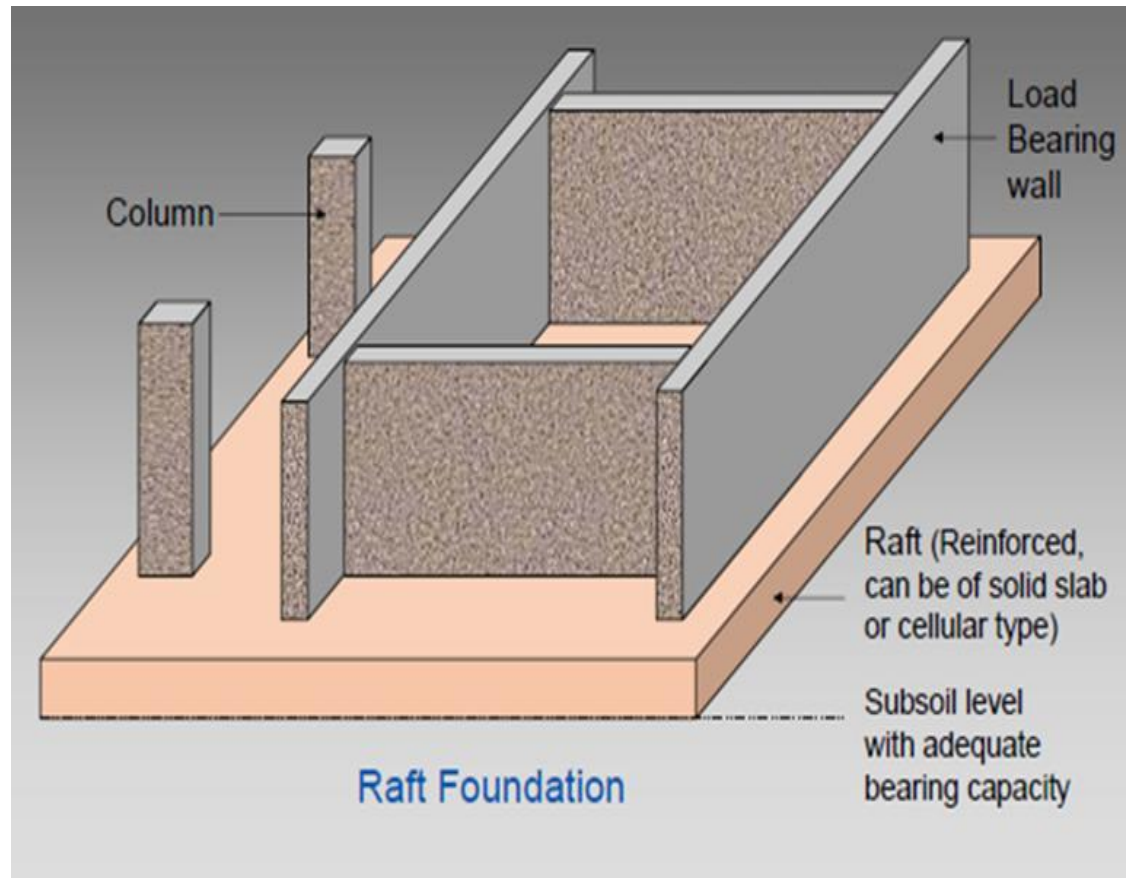
- Foundation is a part of a building where the **base of the building** meets **the ground**.

- The depth of the foundation will vary according to the **bearing capacity** of the soil.

- In normal conditions the **best load-bearing ground** is 900mm below the surface.



CONT'D

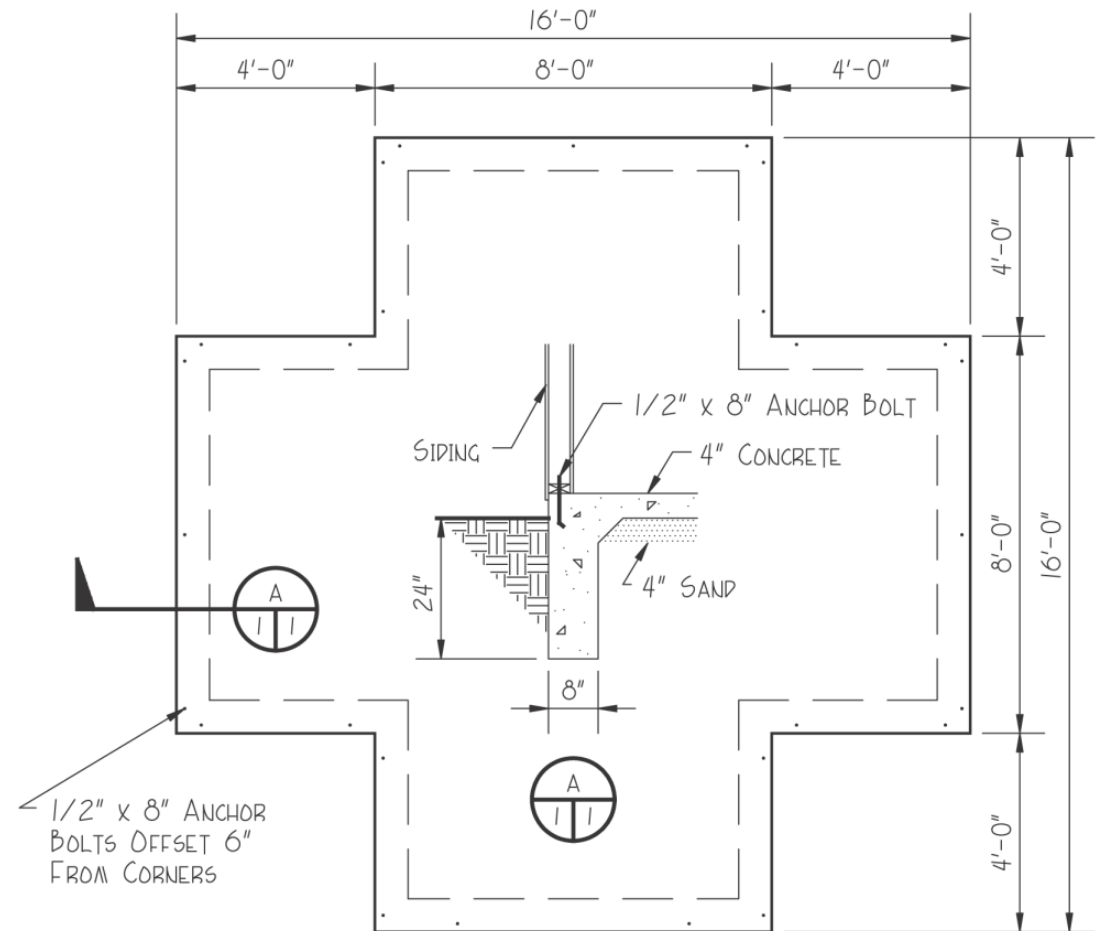


CONT'D

The **foundation plan** is a plan view drawing in section.

Shows the **location** and **size** of footings, piers, columns, **foundation walls**, and supporting beams.

Usually drawn after the **floor plan** and **elevations** have been roughed out.



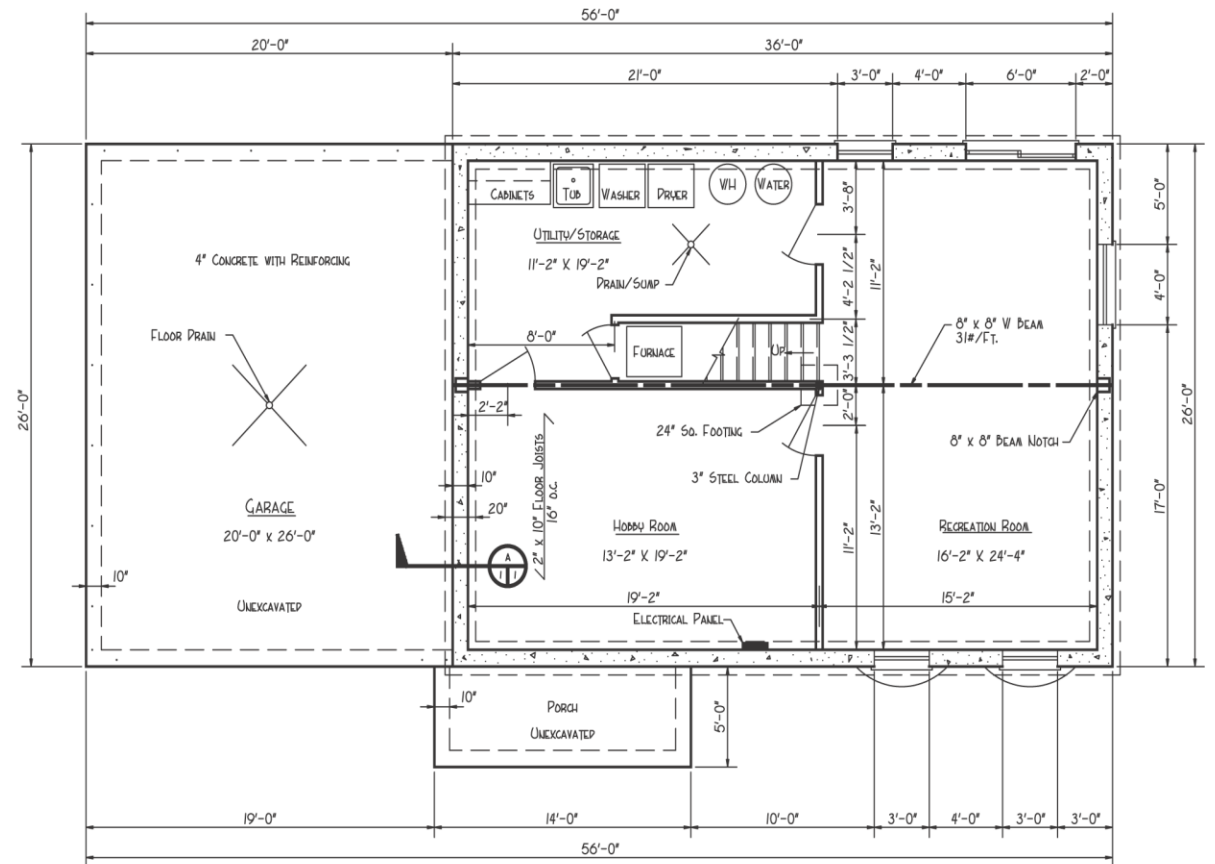
CONT'D

Variety of materials may be used:

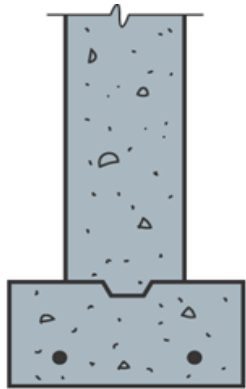
- Cast concrete, concrete block, pressure-treated wood, and stone or brick.

Four basic types of foundation walls:

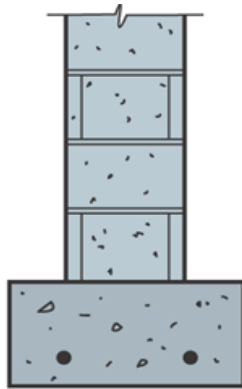
- T-foundation,
- slab foundation,
- pier and post foundation, and
- wood foundation.



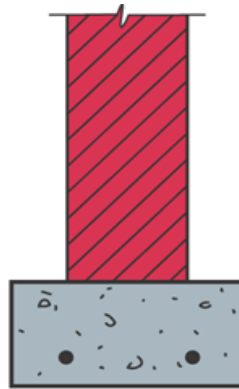
CONT'D



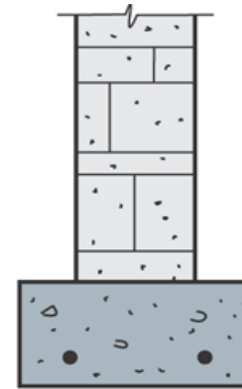
Cast concrete



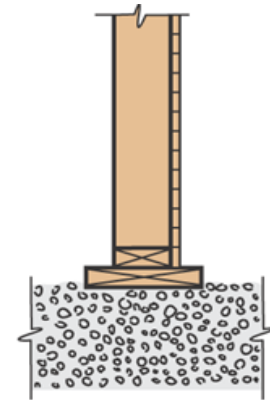
Concrete block



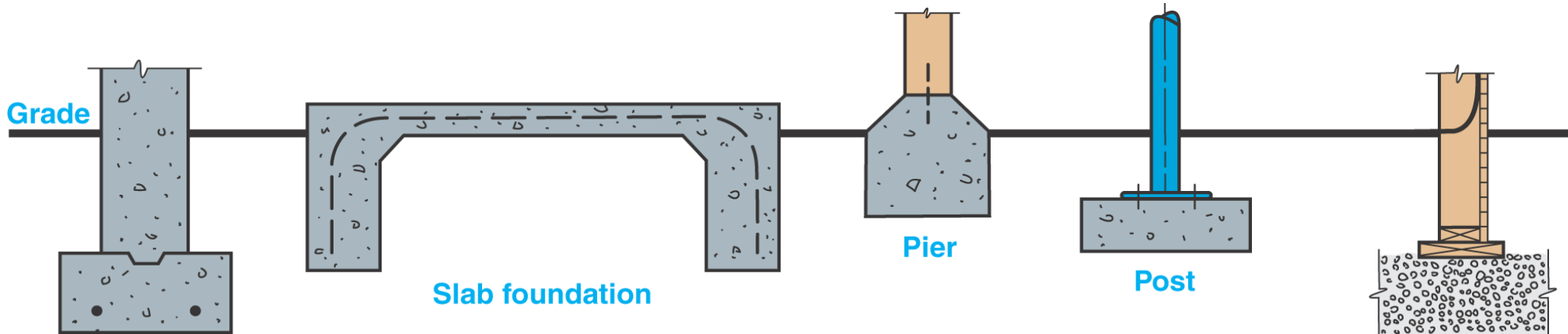
Brick



Stone



Wood



T-foundation

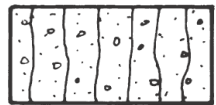
Slab foundation

Pier

Post

Wood foundation

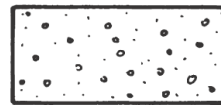
CONT'D



Concrete block



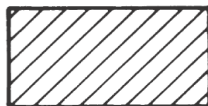
Cast concrete



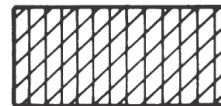
Cinder concrete



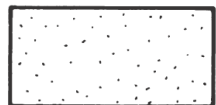
Common brick



Face brick



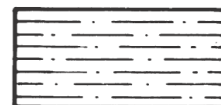
Firebrick



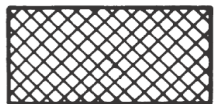
Cut stone



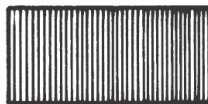
Rubble



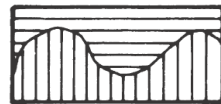
Slate



Structural clay tile



Flashing



Rock



Earth



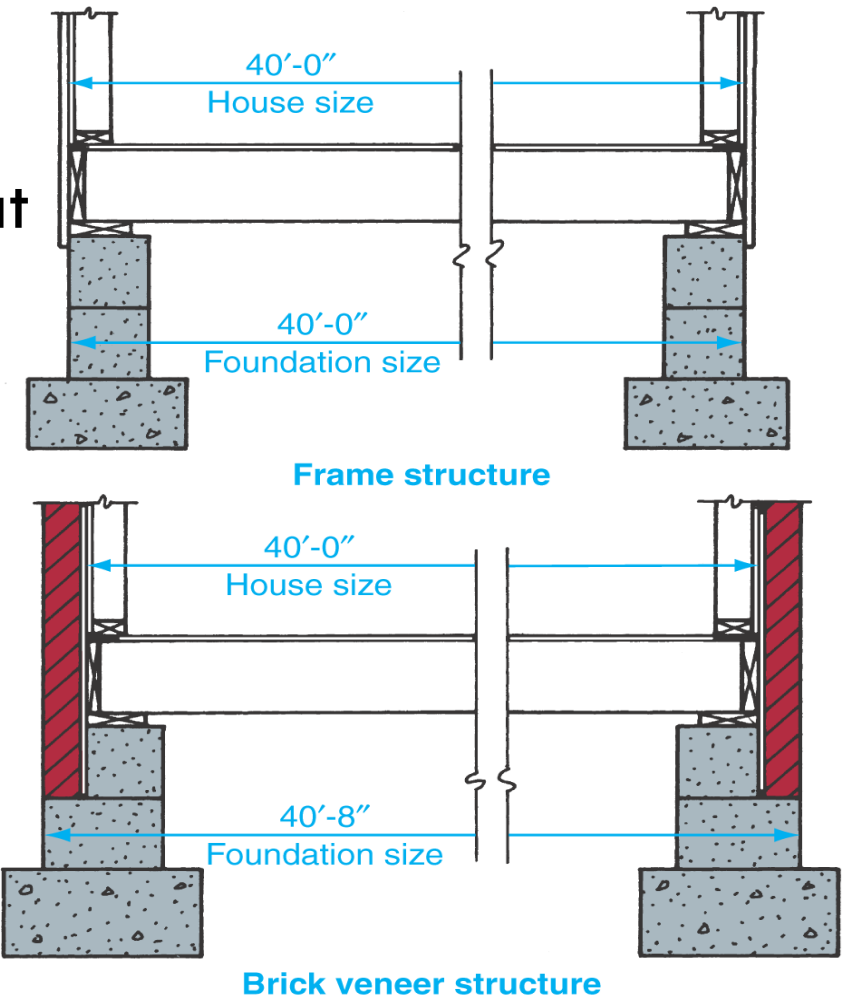
Sand



Gravel

The foundation material should be at least as durable as the rest of the structure.

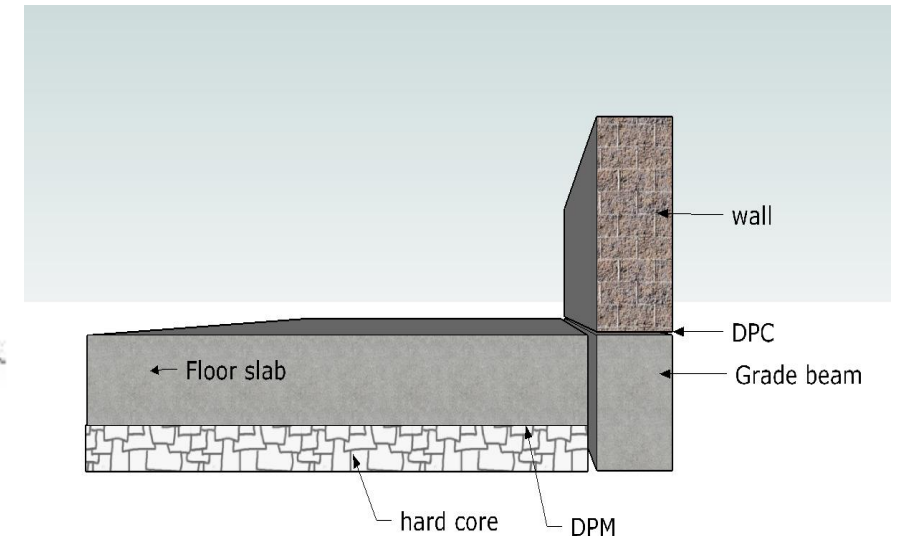
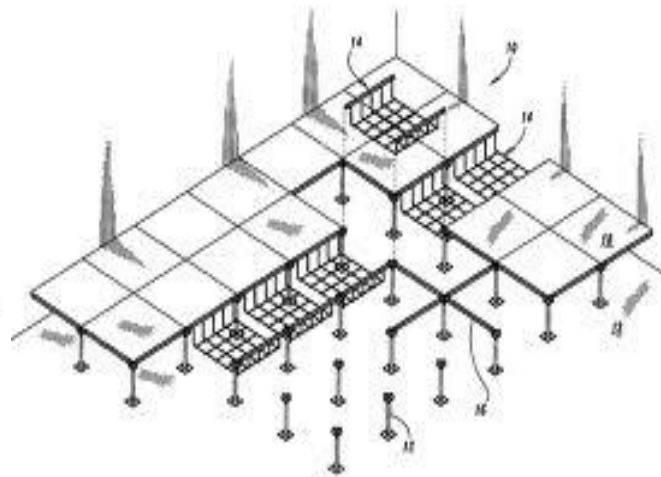
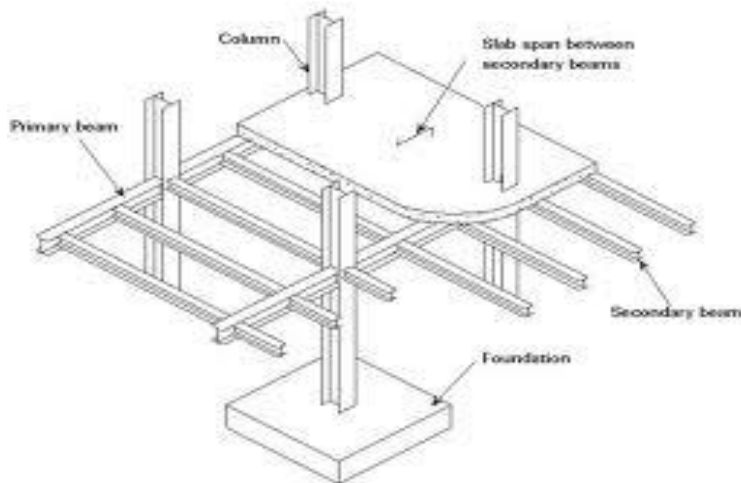
Foundation Plan Symbols



3. FLOOR SYSTEM

The floor systems are the **primary horizontal** platform upon which **building occupants** rest.

They support both the live **loads – people, furniture** (building contents) and **dead loads** – weight of the floor(s) and other **stationary loads** such as walls above etc.

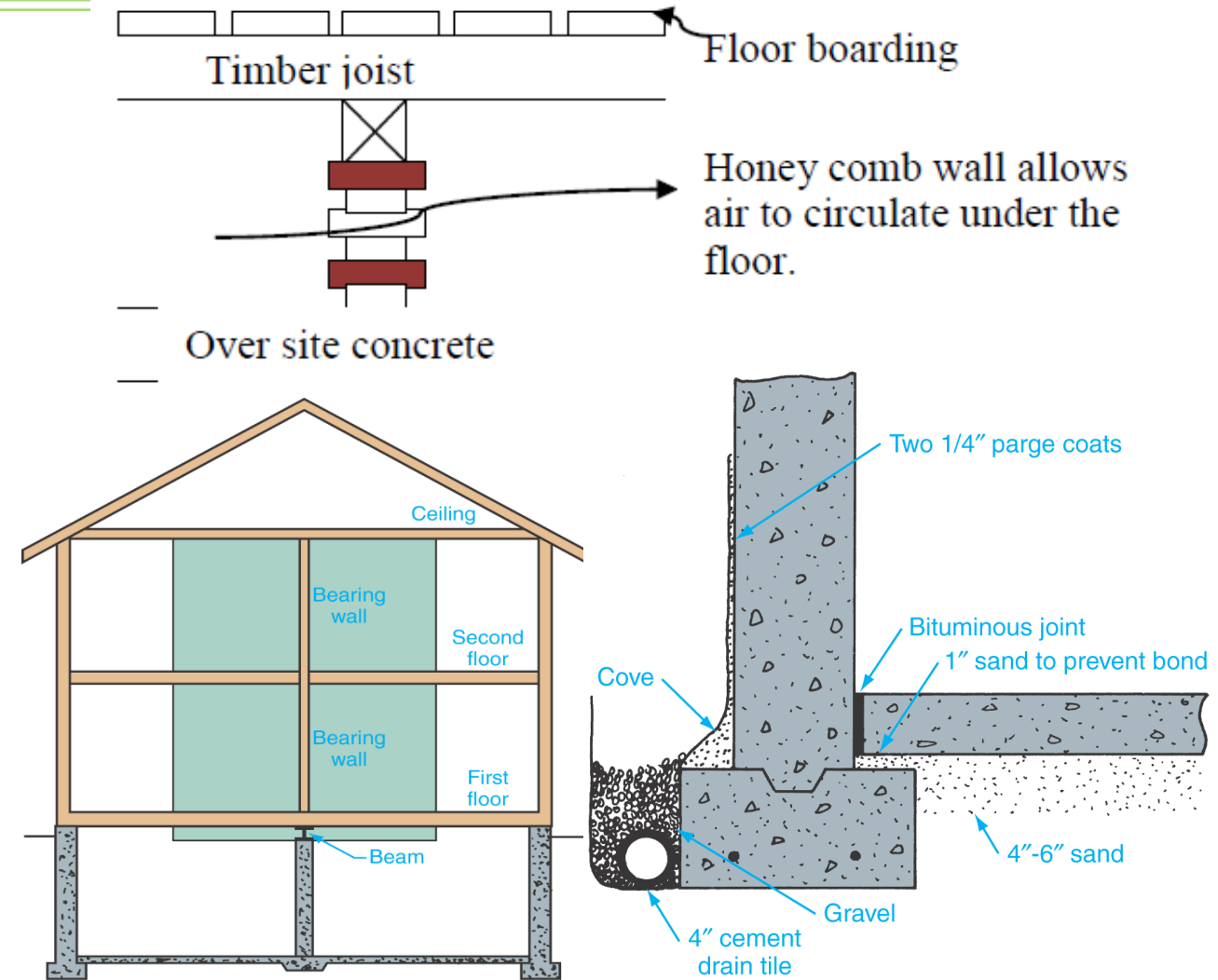


CONT'D

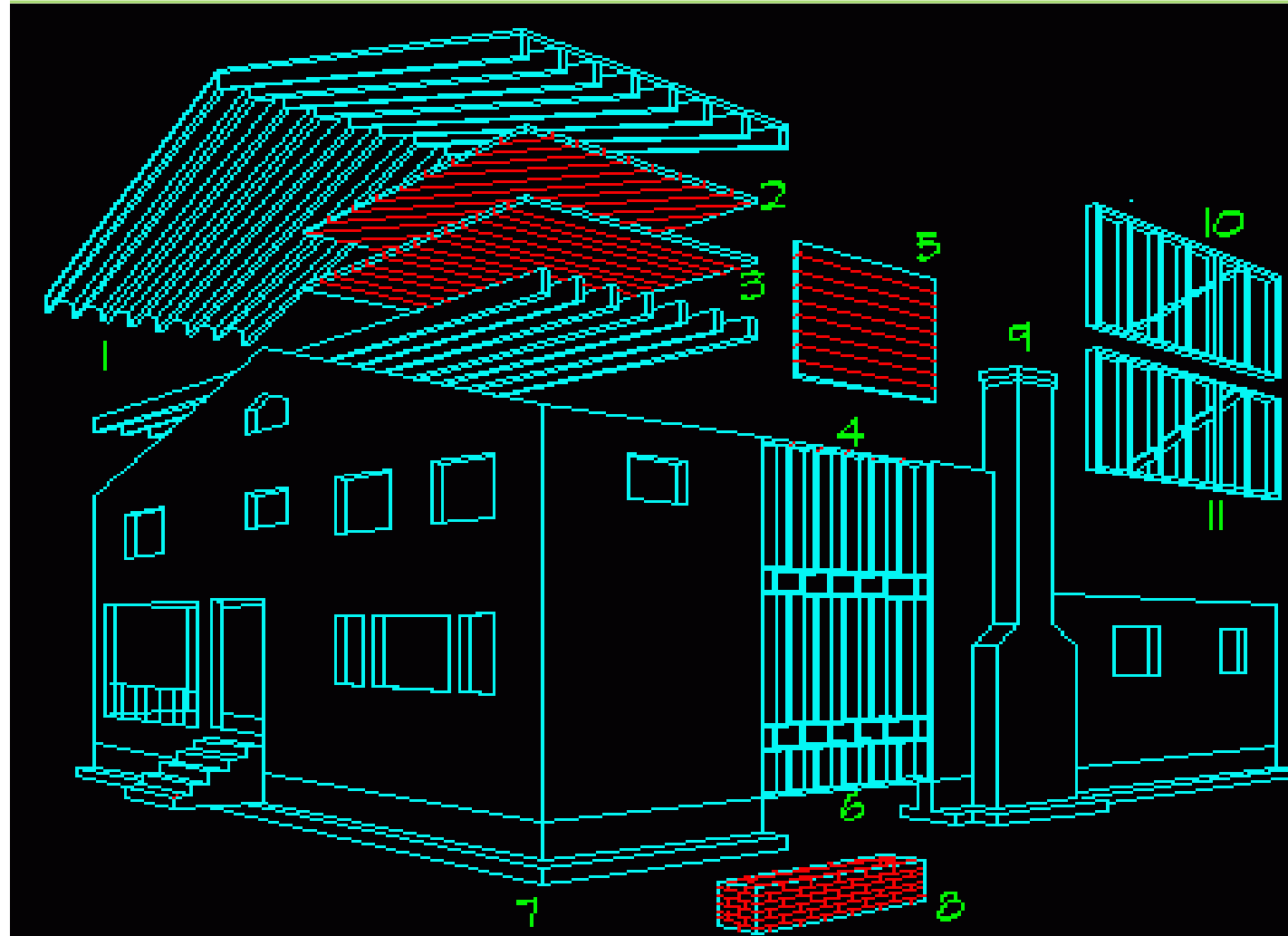
Floors are classified as:

Ground floors are either concrete slabs laid directly on the ground on hard core beds or suspended timber structures supported on honey comb sleeper walls that stand on concrete slabs.

Upper floors are either reinforced concrete slabs or suspended timber structures that are supported on load-bearing walls.



SUPER STRUCTURE



Roof/floor span system:

1. wood joist and rafter
2. diagonal sheathing
3. straight sheathing

Foundation/connections:

6. unbraced cripple wall
7. concrete foundation
8. brick foundation

Wall system:

4. stud wall
5. horizontal siding

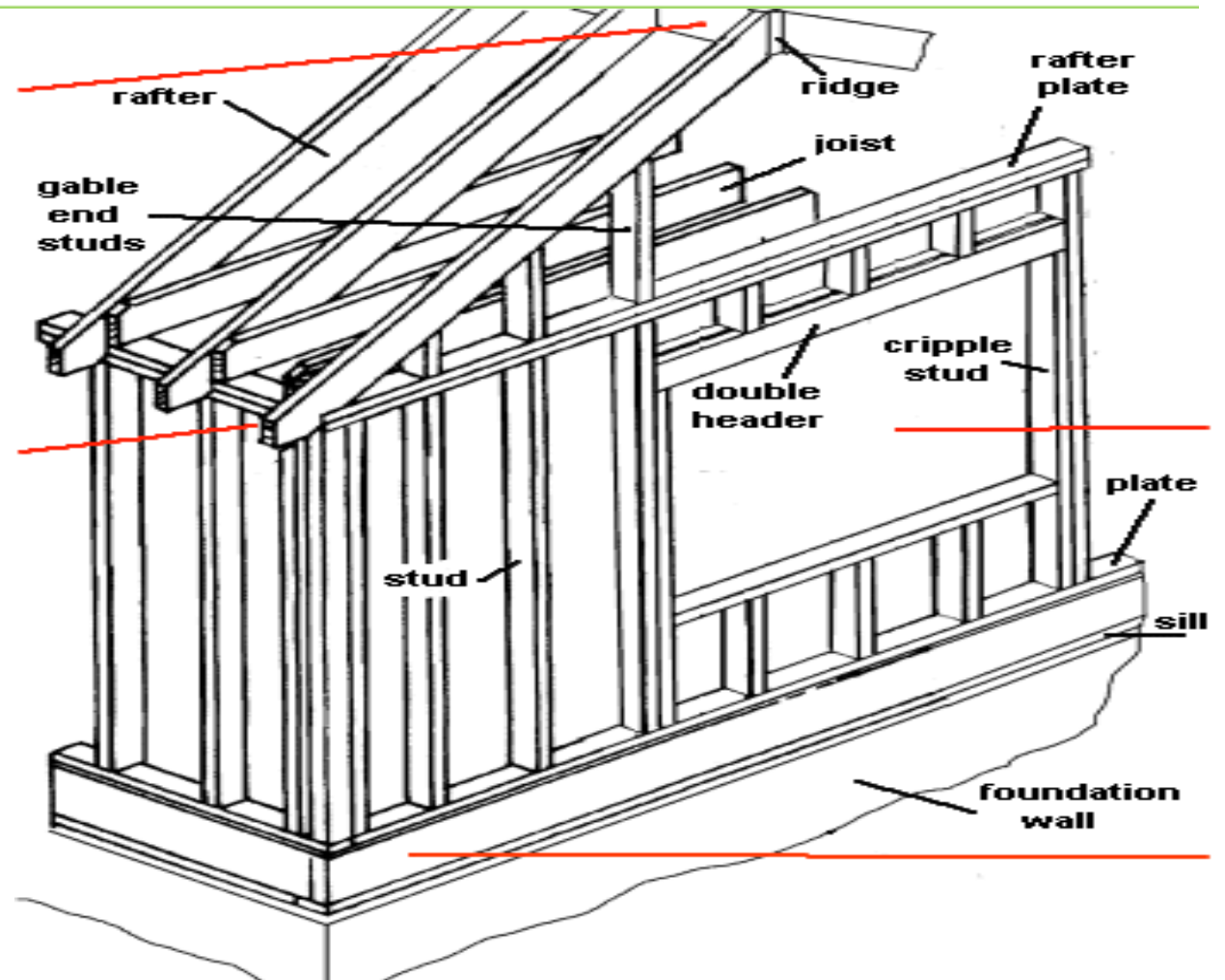
Bracing and details:

9. unbraced brick chimney
10. diagonal blocking
11. let-in brace

4. WALL SYSTEMS

The wall systems are **the primary vertical elements** that provide both **building supports** and **protective** skin against weather elements.

They form the **exterior envelope** as well as dividers to define **interior spaces**.



CONT'D

Walls may be divided into two types:

- a) **Load-bearing walls** that support loads from floors and roof in addition to their own weight and resist side-pressure from.
- b) **Non-load-bearing walls** that carry no floor or roof loads. Each type may be further divided into external or enclosing walls, and internal dividing walls.

A: load bearing external wall
C: load bearing internal wall
D: non load bearing internal wall



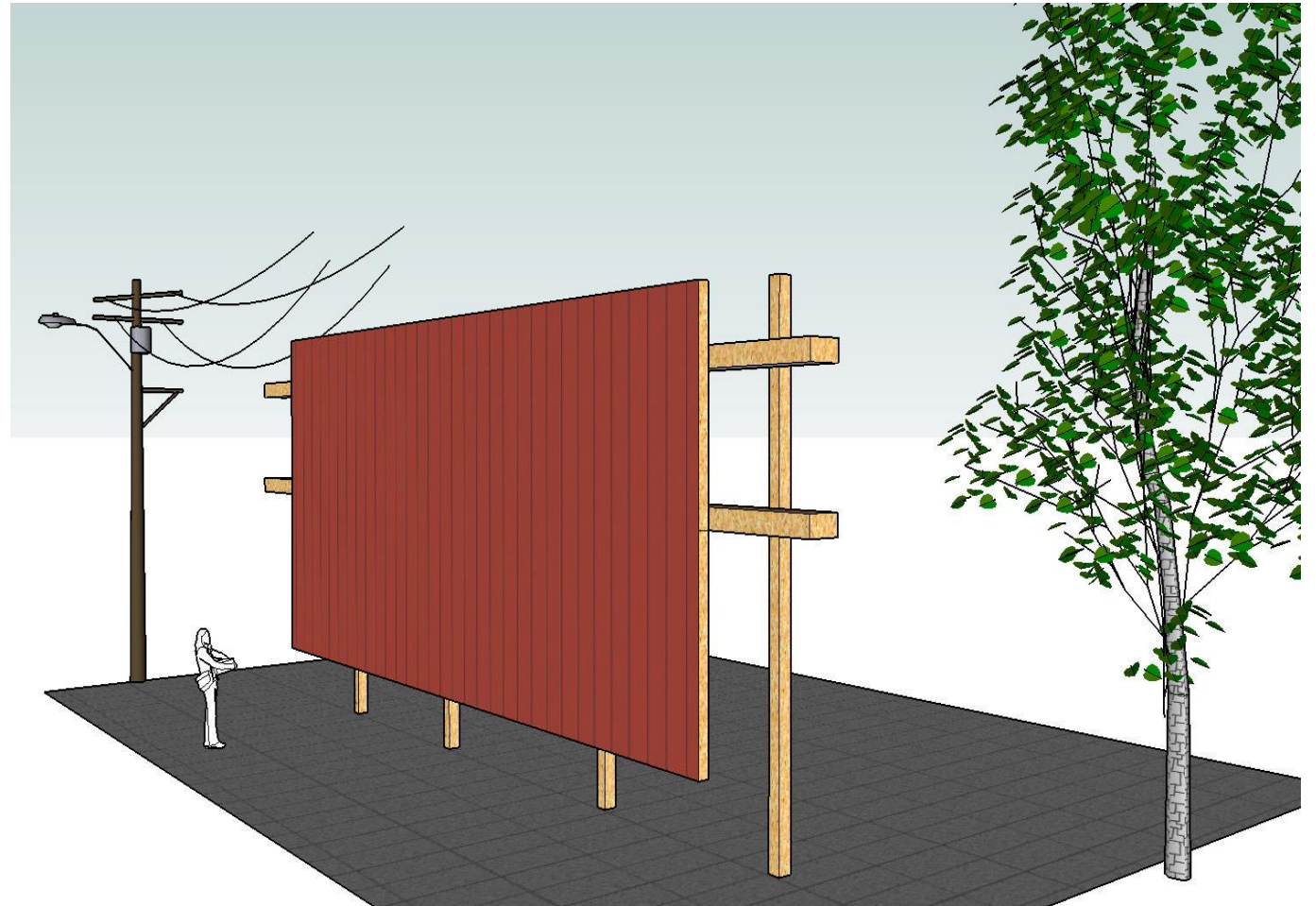
CONT'D

External non load bearing walls should have the following characteristics.

Strength (resistance to the dead and live loads).

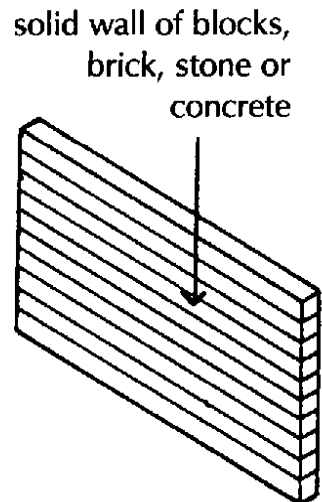
Stability (resistance to forces such as wind).

Resistance to weather

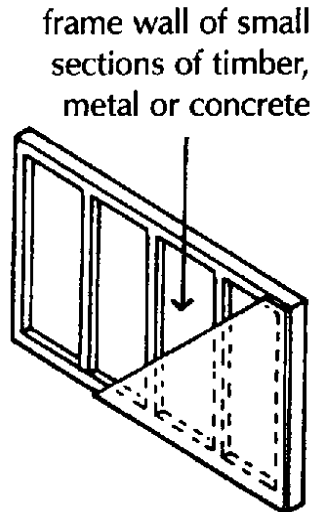


CONT'D

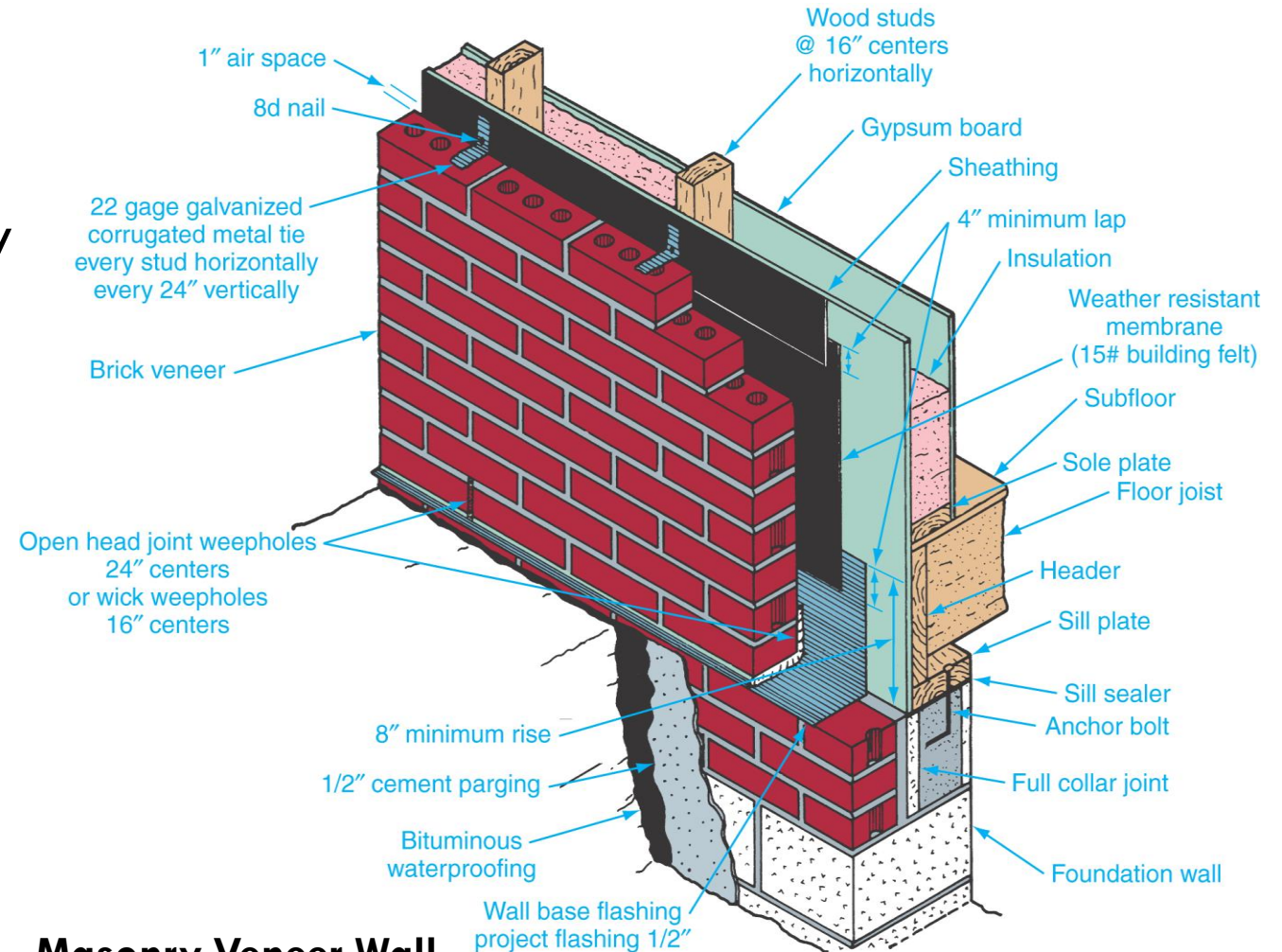
Walls can be constructed from various materials either as **composite** (combinations of materials) or **homogeneous** (single material). They can be made from concrete, masonry, wood framing or metal framing.



Solid wall



Frame wall



Masonry Veneer Wall

CONT'D

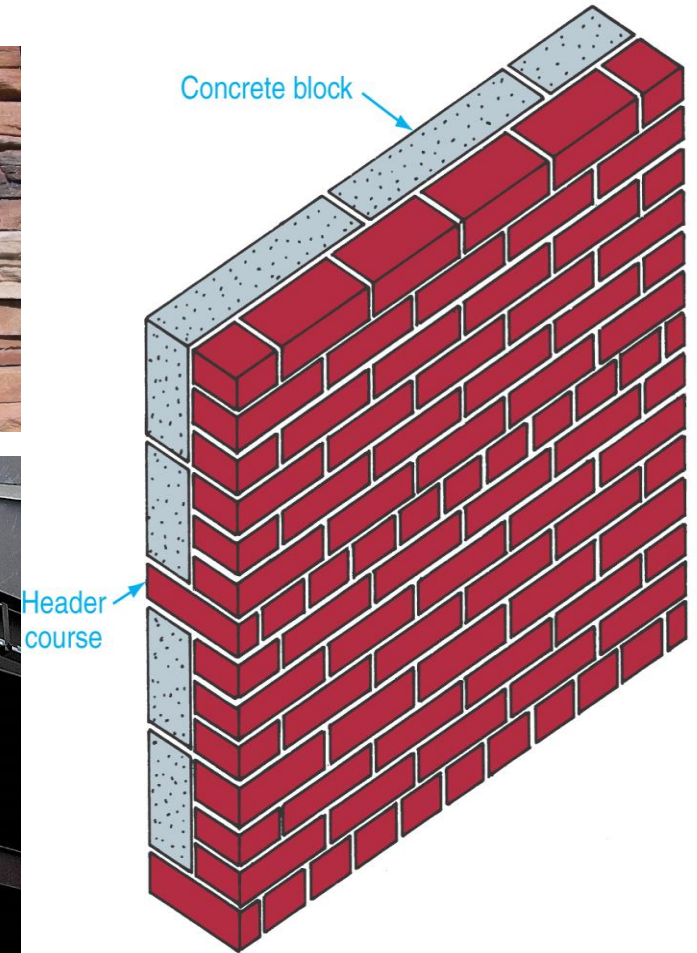
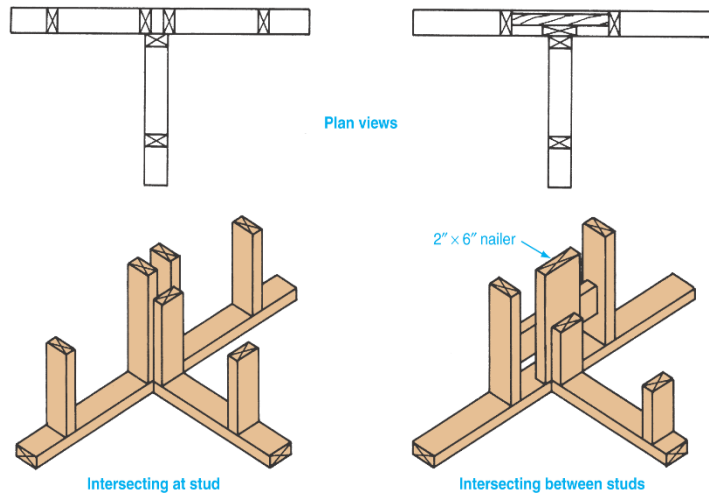
The main requirements for the **selection of building materials** are stability and durability. The most common materials for external walls are:

Blocks (concrete):

Stone

Bricks

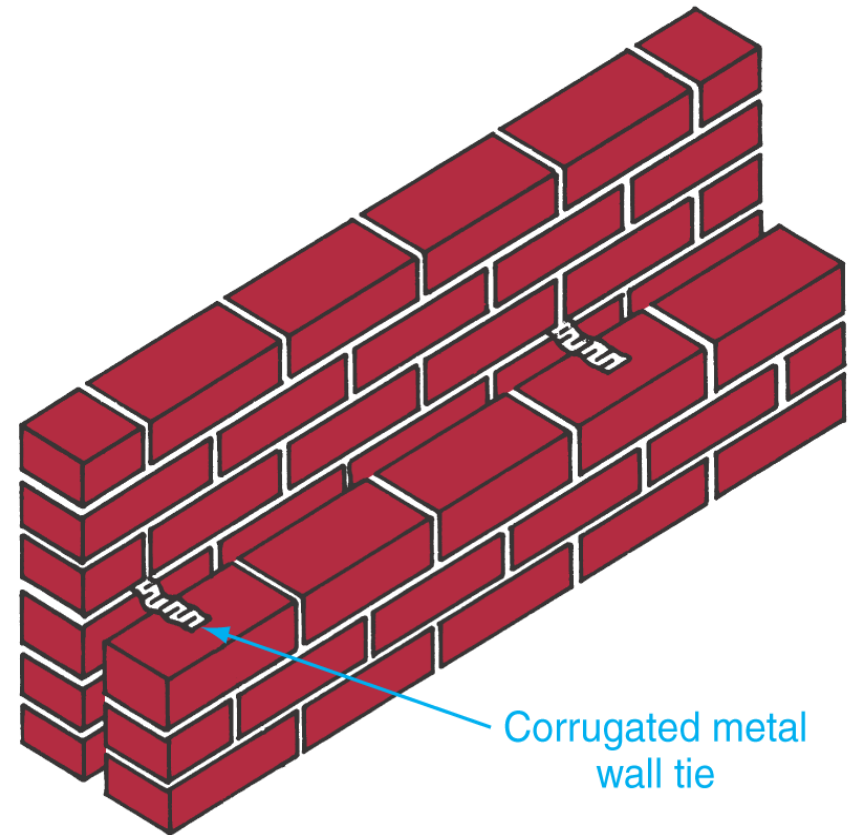
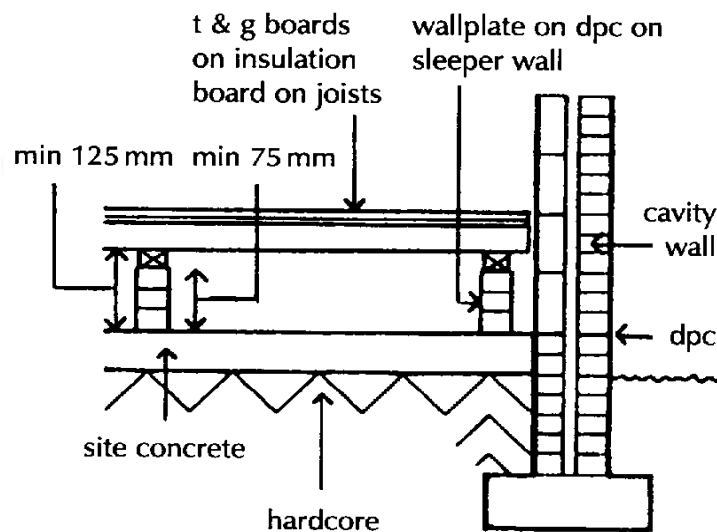
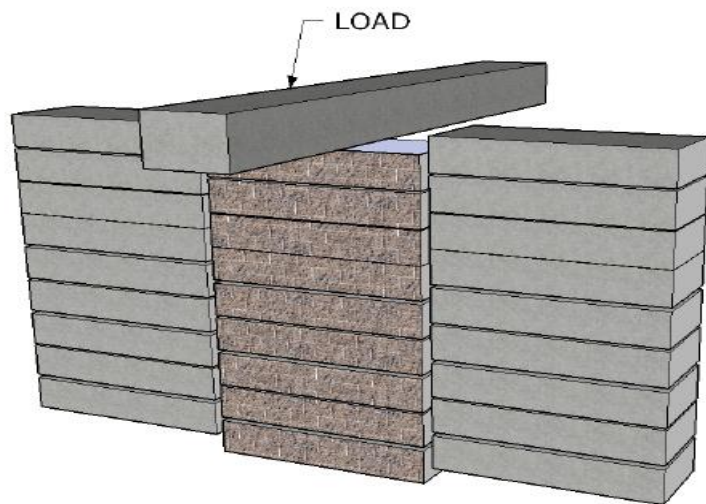
Wood



CONT'D

A **masonry wall** may be solid or cavity-type wall.

- a) A **solid masonry** wall using a header course to bond the two thicknesses together.
- b) A **cavity wall** that uses corrugated metal wall ties to bond the two thicknesses together.



5. DOORS AND WINDOWS

Doors and windows perform several functions.

- i. They shield an opening from the elements.
- ii. Add decoration and expand visibility.
- iii. Emphasize the overall design.
- iv. Provide light and ventilation.



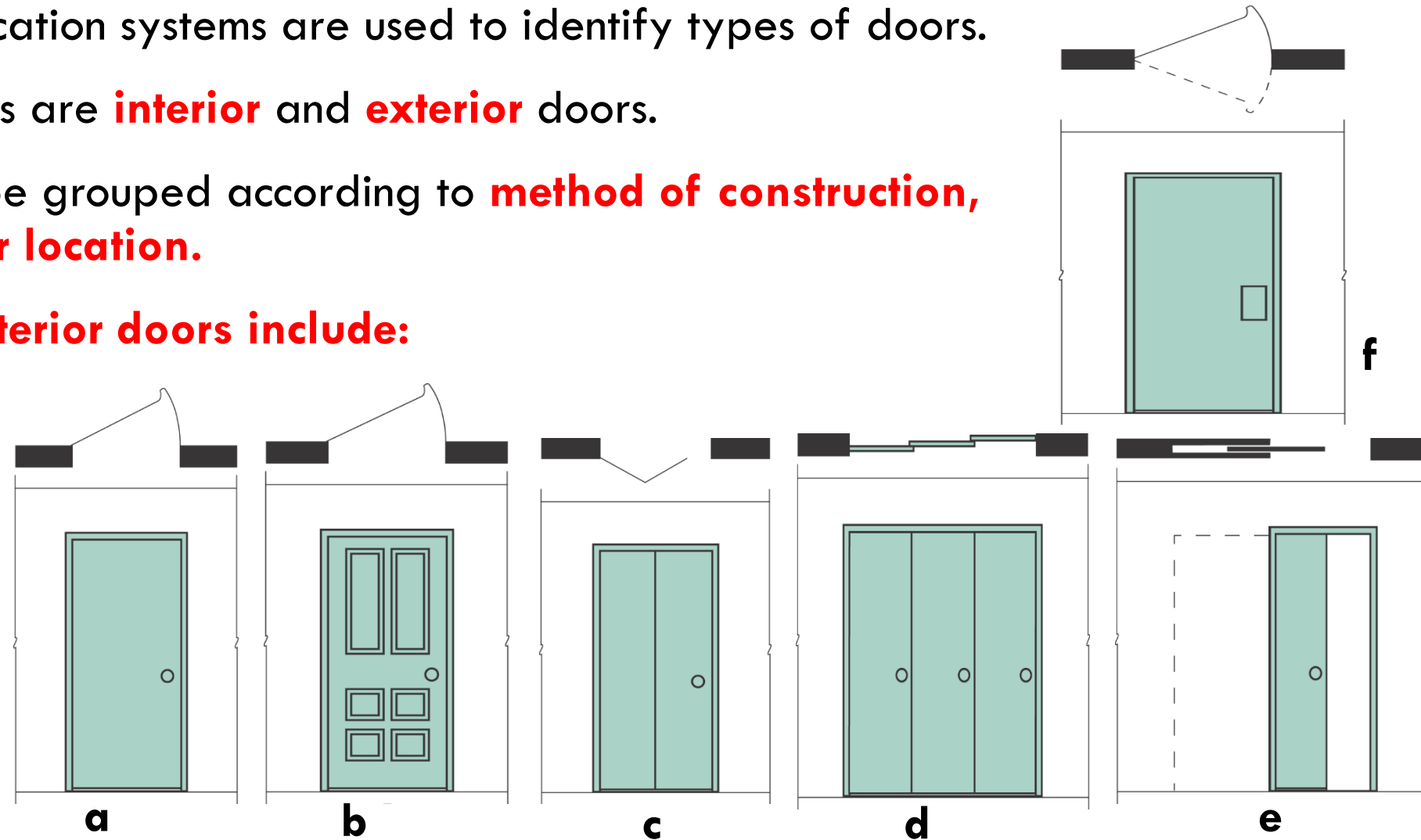
A. DOOR

Several door classification systems are used to identify types of doors.

- i. Two broad classes are **interior** and **exterior** doors.
- ii. Doors also may be grouped according to **method of construction, uses, function, or location.**

Common types of interior doors include:

- a) Flush,
- b) panel,
- c) bi-fold,
- d) sliding,
- e) pocket,
- f) double-action,



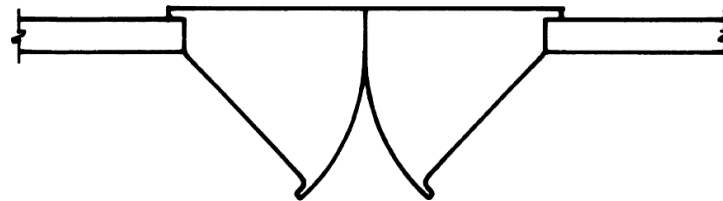
CONT'D

Exterior doors are generally solid core and thicker than interior doors.

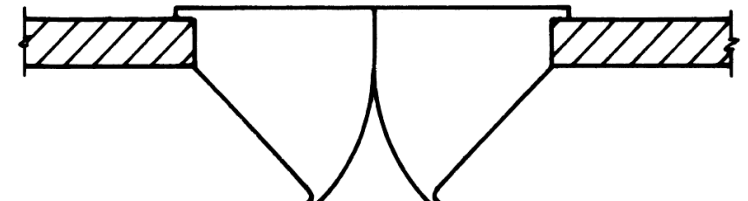
Exterior doors may have one or more glass panels to provide visibility.

Exterior door styles include

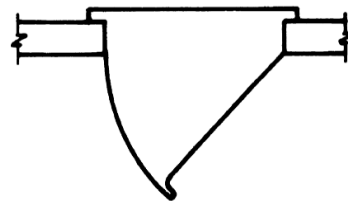
- a) flush
- b) Panel
- c) swinging
- d) sliding glass doors.



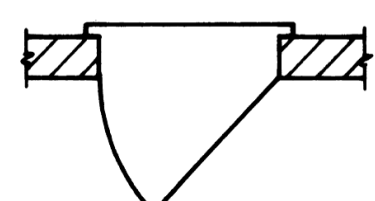
Double flush or panel doors in a frame wall



Double flush or panel doors in a masonry wall



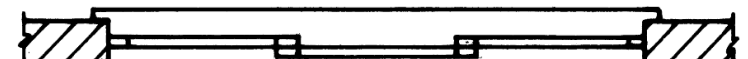
Single flush or panel door in a frame wall



Single flush or panel door in a masonry wall



Sliding door unit in a frame wall

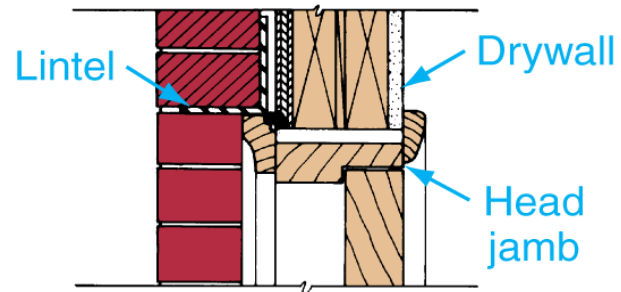


Sliding door unit in a masonry wall

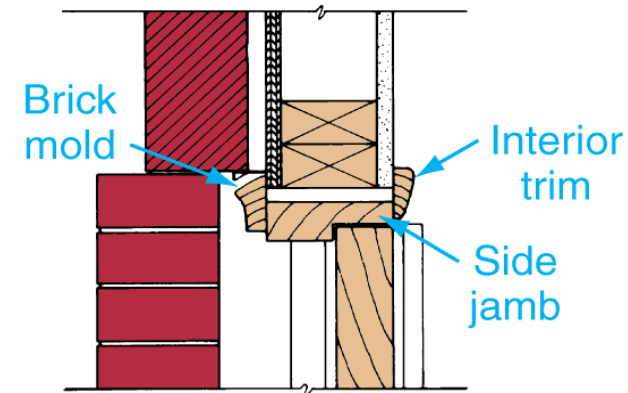
CONT'D

Head jamb

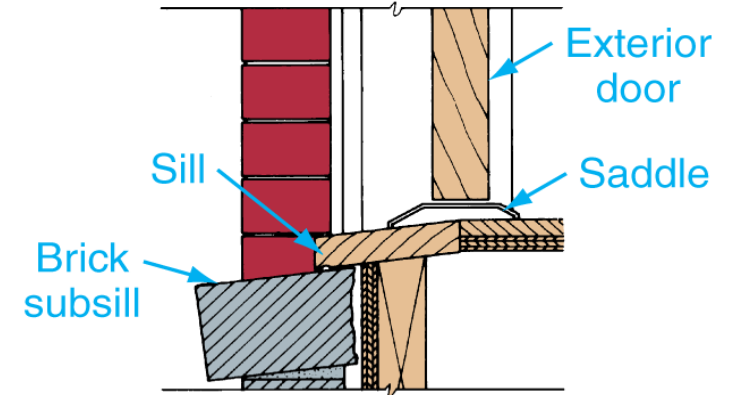
Brick veneer



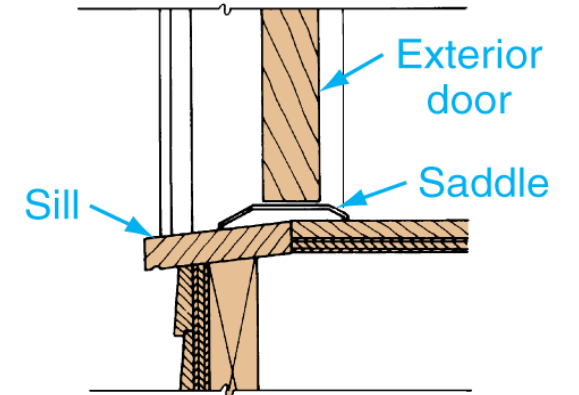
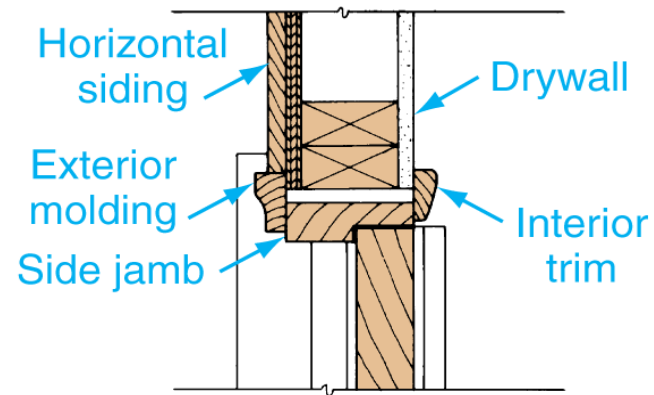
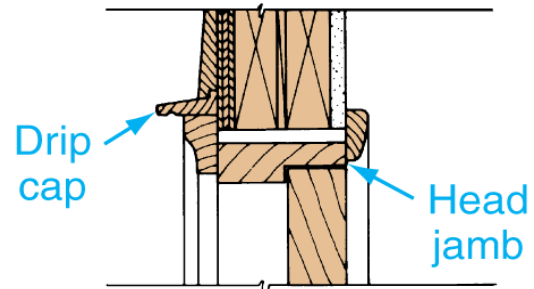
Side jamb



Sill

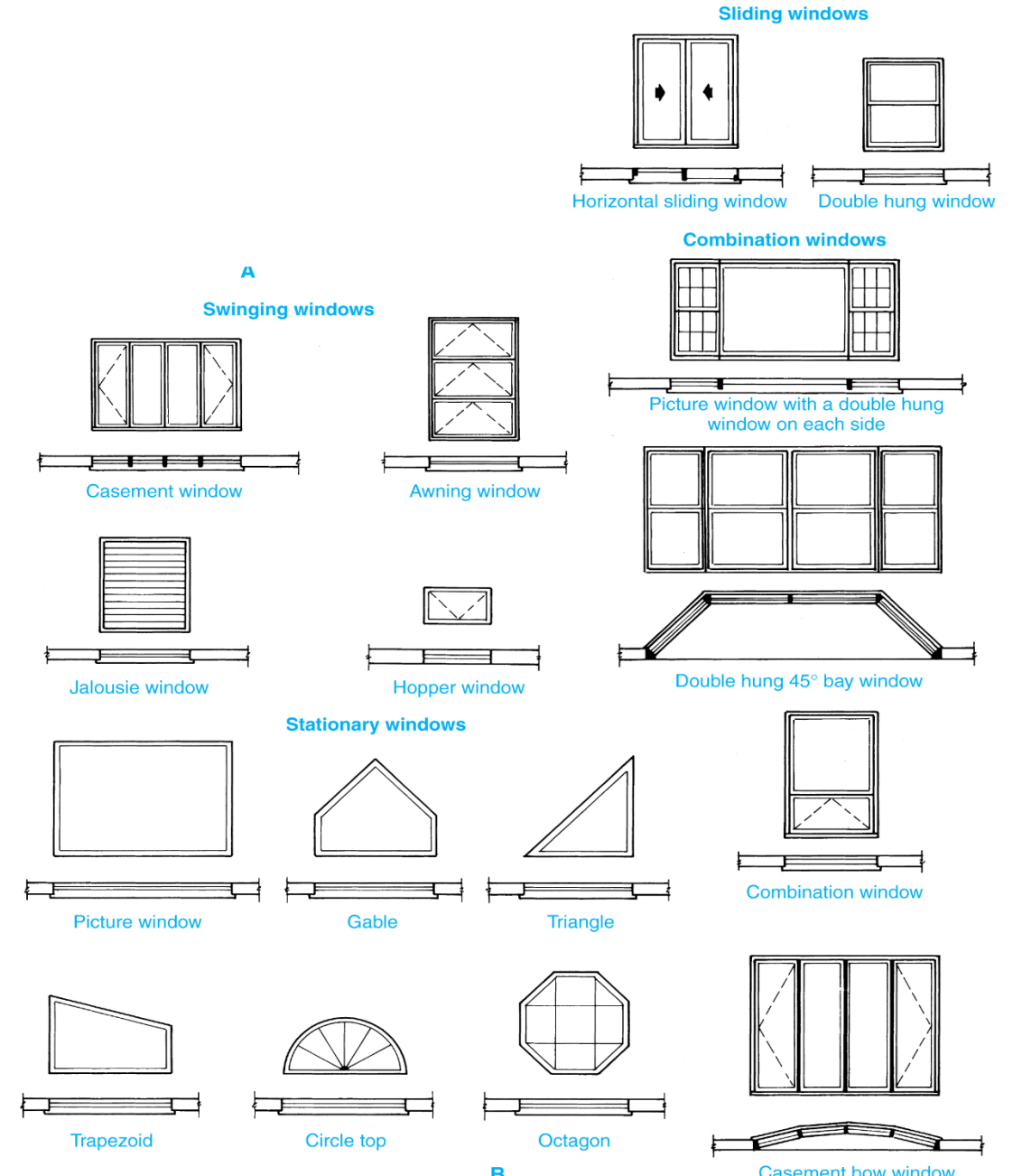


Frame



B. WINDOWS

- a. Admit light from outside.
- b. Provide fresh air and ventilation.
- c. Help create an atmosphere inside.
- d. Add detail, balance, and design to the exterior of the house.
 - i. Many types of windows are available.
 - ii. Most types have unique proportions.
 - iii. Windows are made from wood, metal, or plastic.



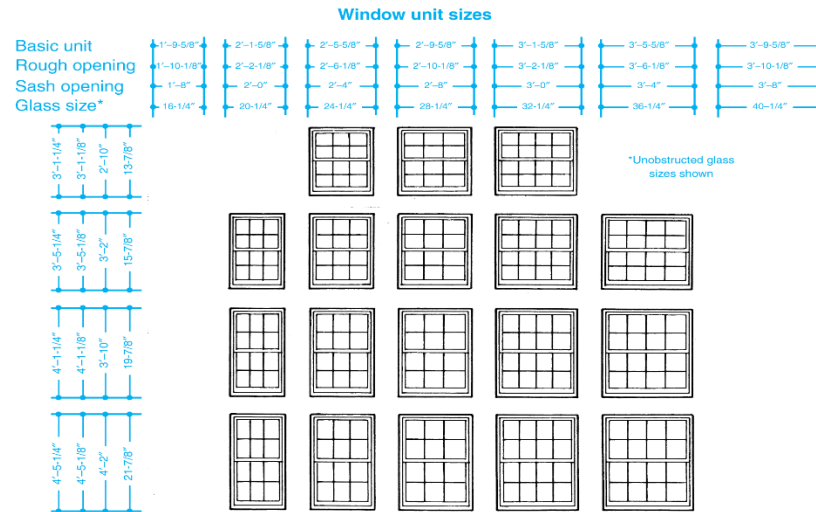
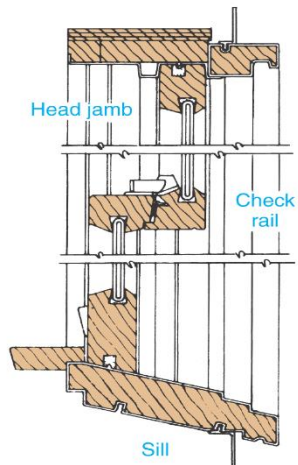
CONT'D

There are three basic types of windows used in residential construction.

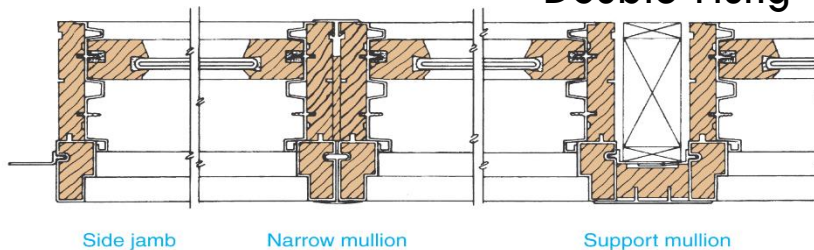
a) **Sliding.**

b) **Swinging.**

c) **Fixed.**

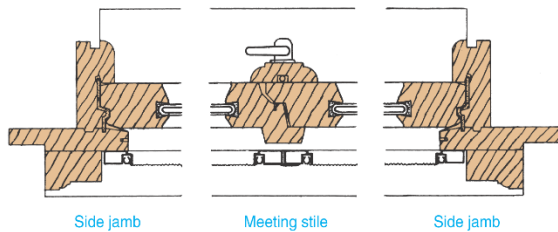
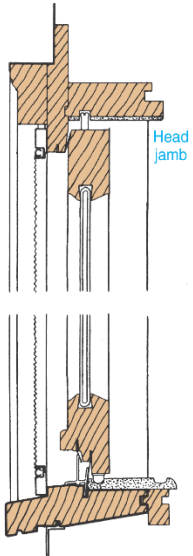
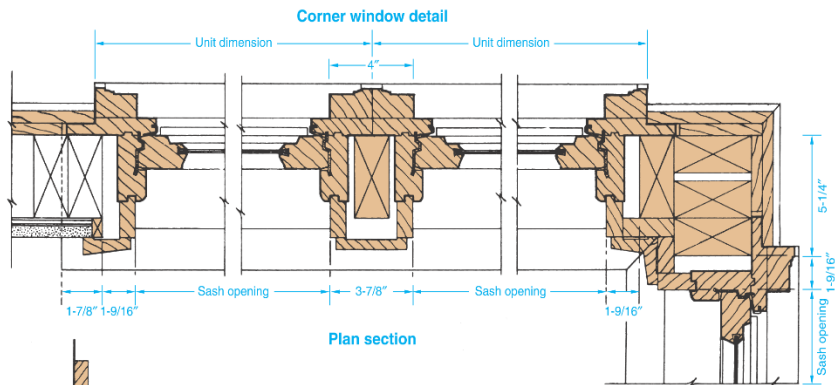


Double-Hung Window Details



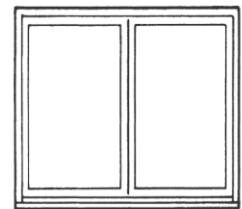
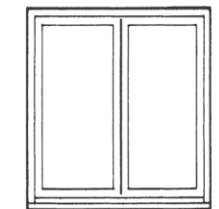
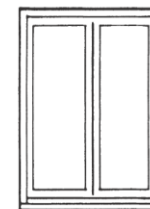
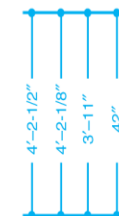
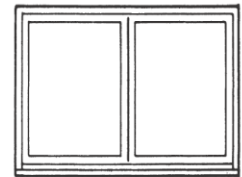
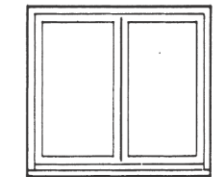
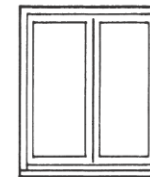
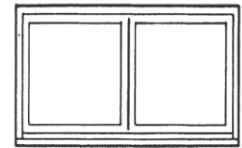
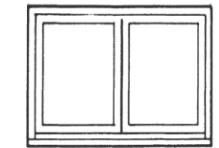
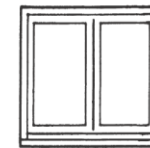
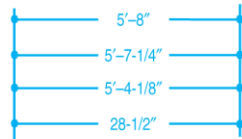
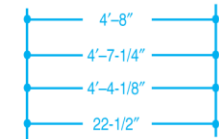
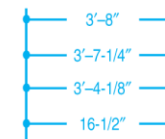
CONT'D

Horizontal sliding windows usually have two sashes that move in a tract.



Sizes and layouts

Unit dimension
Rough opening
Sash opening
Glass size



CONT'D

The swinging windows:

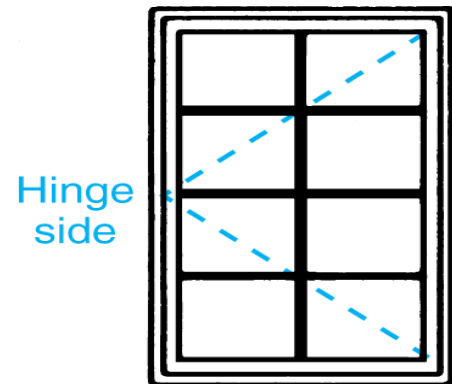
There are four common types of swinging windows:

- a) **Casement**
- b) Awning
- c) Hopper
- d) fixed



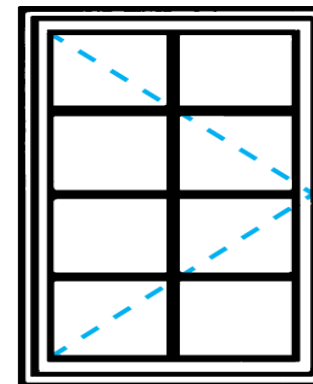
Grille patterns	Unit dimensions	2'-0-1/8"	4'-0"	5'-11-7/8"
	Rough opening	2'-0-5/8"	4'-0-1/2"	6'-0-3/8"
	Sash opening	1'-9-7/8"	3'-9-3/4"	5'-9-5/8"
	Glass*	19-7/8"	19-7/8"	19-7/8"
	2'-11-15/16"			
	3'-0-1/2"			
	3'-4-13/16"			
	4'-0"			
	4'-0-1/2"			
	4'-0-1/2"			
	4'-0-1/2"			

Casement Windows



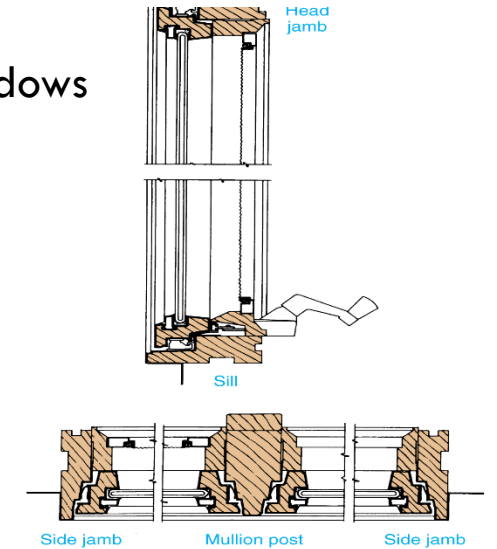
Hinge side

Left-hand hinge



Hinge side

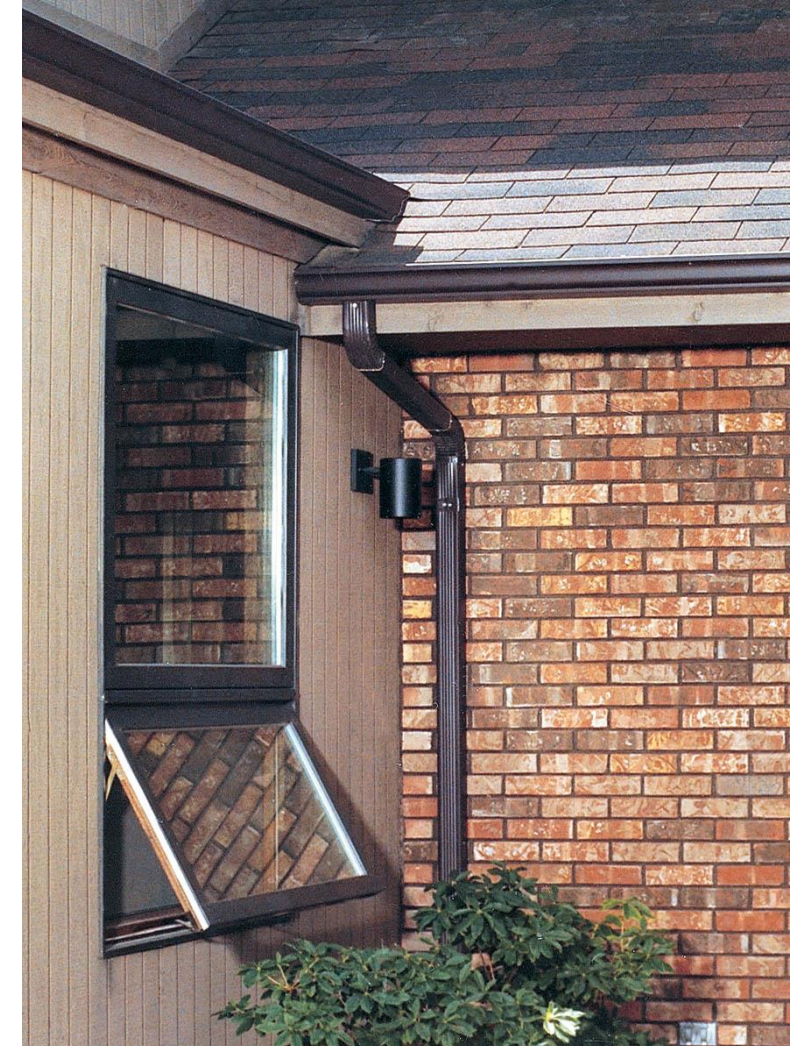
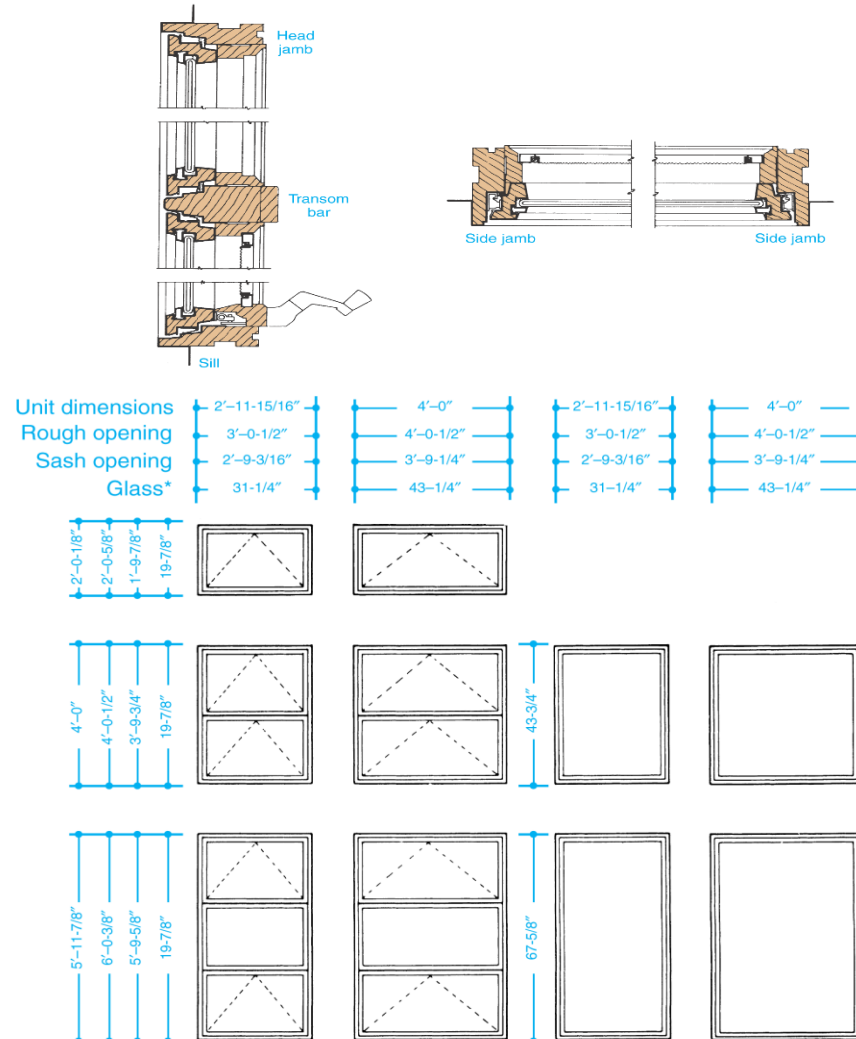
Right-hand hinge



CONT'D

awning window

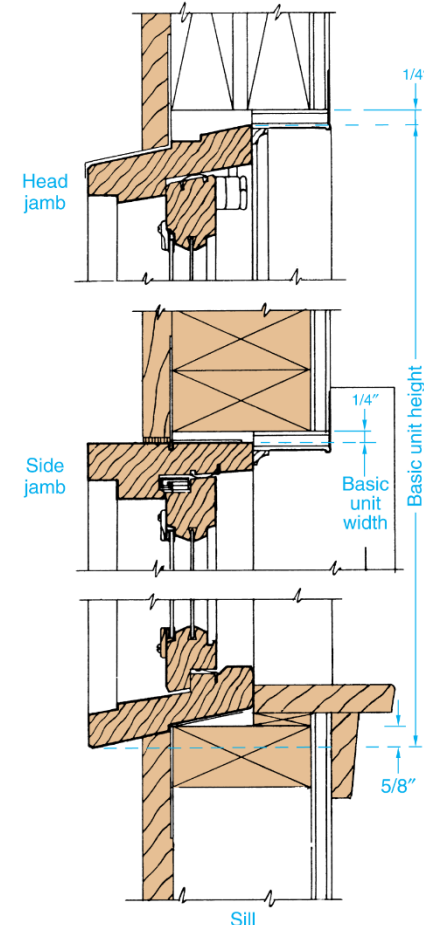
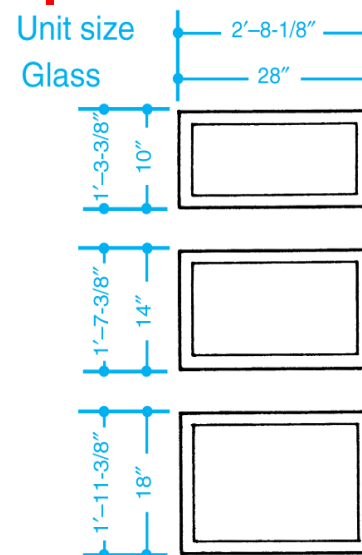
- i. Each sash in an awning window is **hinged at the top**.
- ii. May have one or more sashes.
- iii. Usually crank operated.



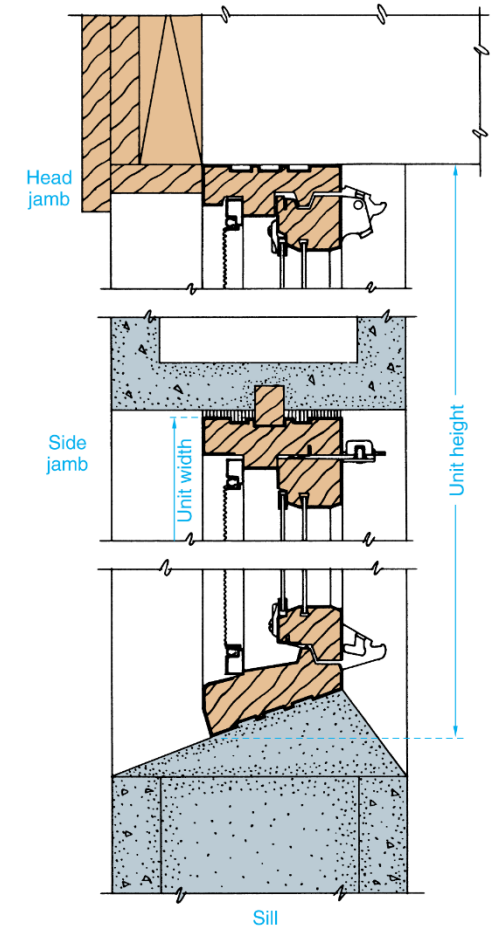
CONT'D

A hopper window is usually hinged at the bottom and swings inward.

- Opened by a **lock-handle** at the top of the sash.
- Usually made as a **single unit** only.
- Popular for basements; **directs air upward**.



Single frame wall construction with drywall interior returned into jambs. Note position of unit in wall.



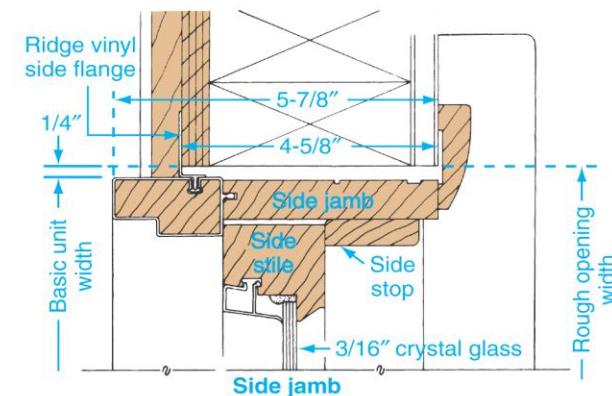
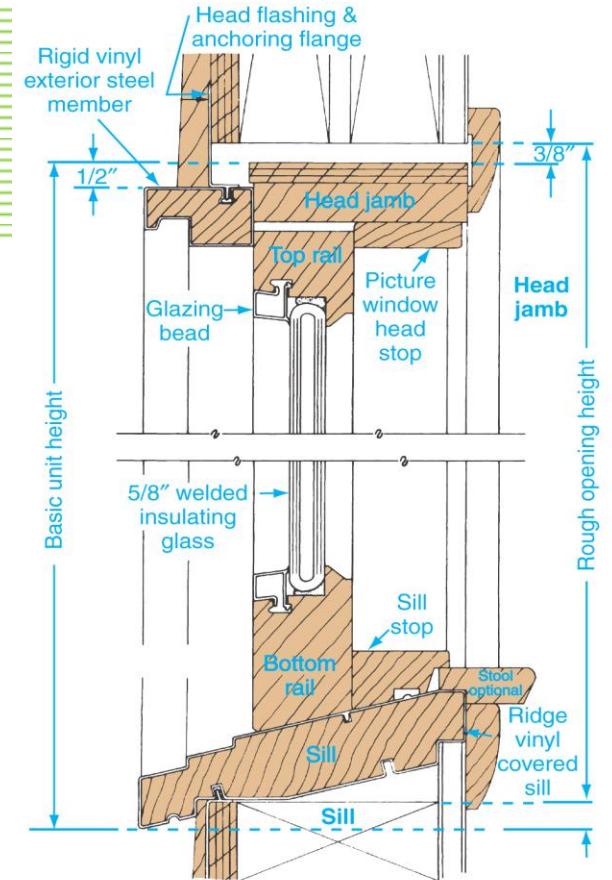
A

B

CONT'D

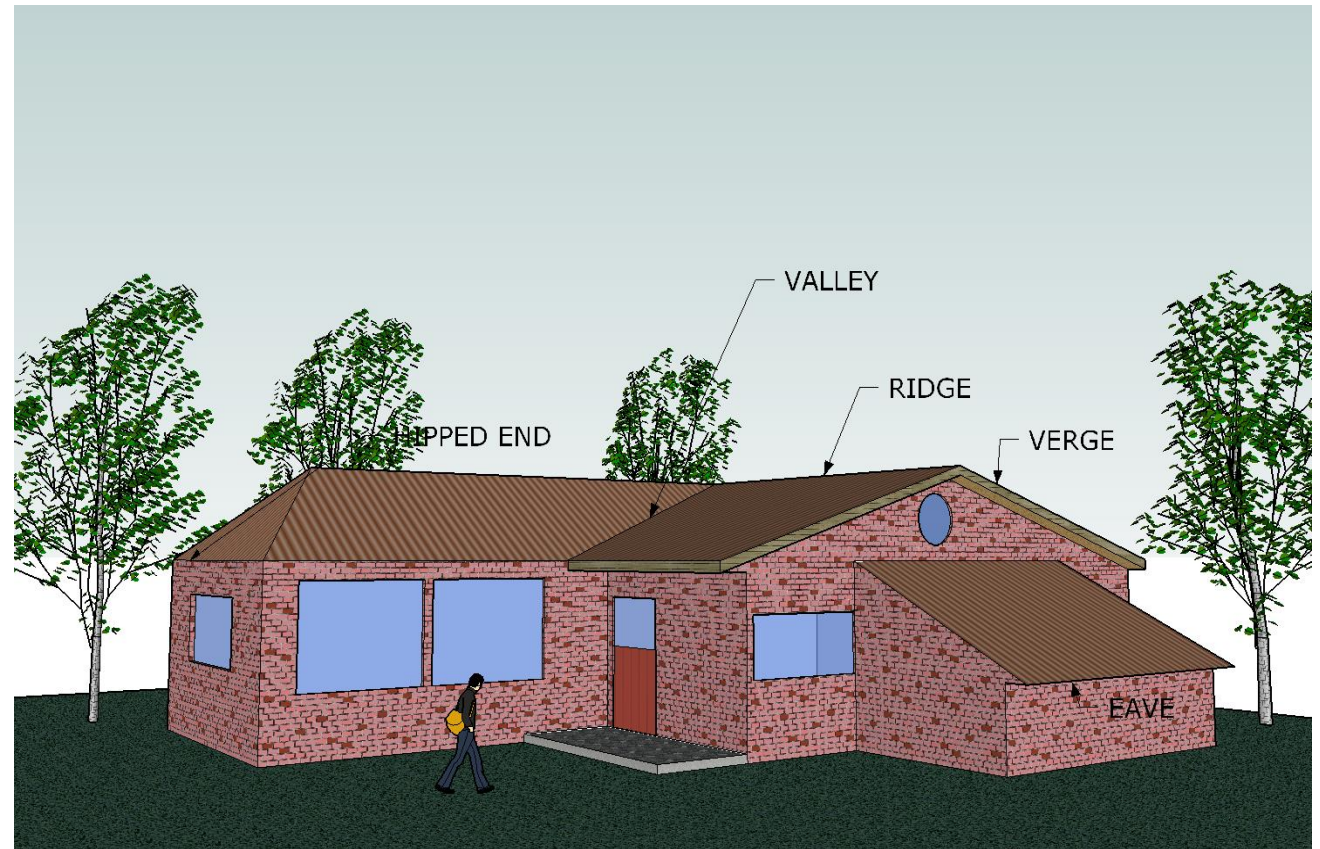
Fixed windows

- a. Fixed windows provide a view and/or admit light.
- b. They do not permit ventilation.
- c. Usually custom made.
- d. Do not open.
- e. Examples include picture windows, circle top windows, and special shapes.



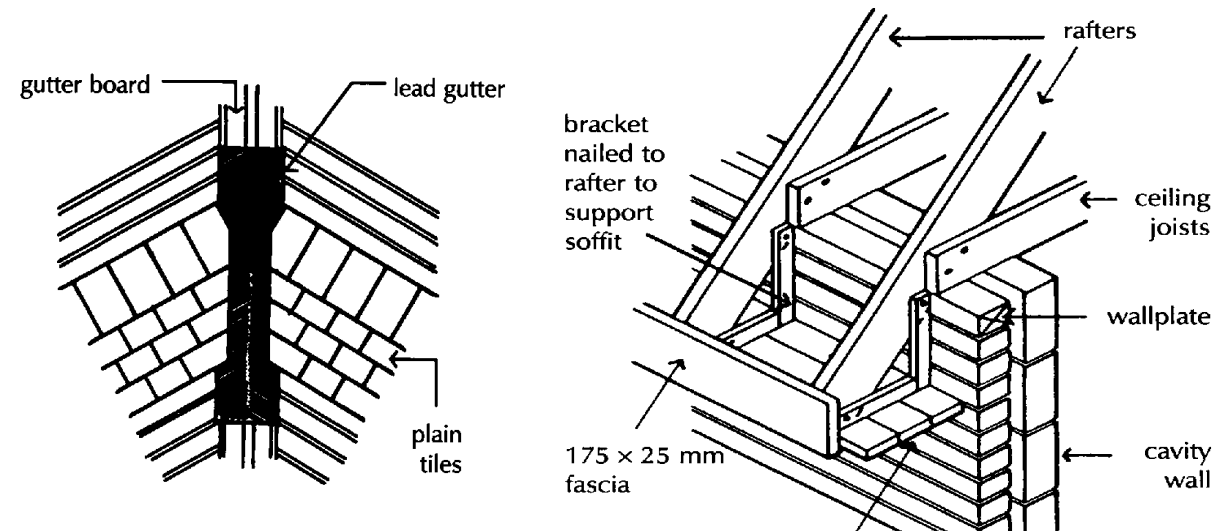
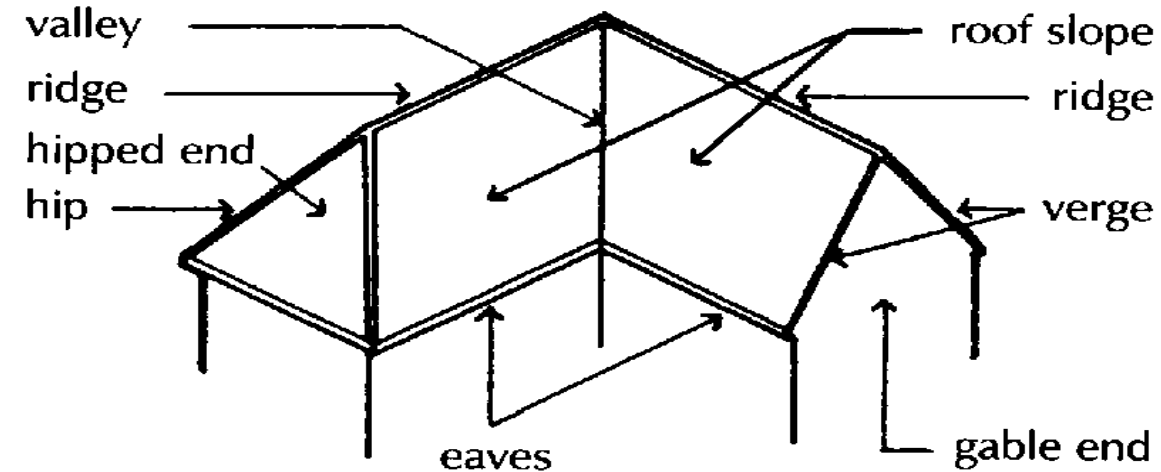
6. ROOF SYSTEM

- The **roof system** is the upper portion of a building which provide **primary protection** for the **interior spaces** from the weather elements.
- The design of a **roof system** can create a great impact on the **visual image** of a building.
- Many famous buildings are known for their **unique dome roof designs**



CONT'D

- a) **Eave:** the bottom end of the roof where it meets the wall.
- b) **Gable end:** the vertical triangular end of a building.
- c) **Hip:** the point where two inclined roof surfaces meet over an external angle.
- d) **Ridge:** a timber at the apex of the roof that the tops of the rafters.
- e) **Valley:** the point where two inclined roof surfaces meet over an internal angle.
- f) **Verge:** the edge of a roof that meets a gable wall.



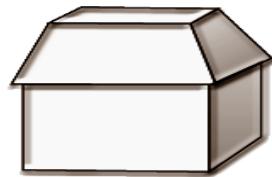
CONT'D

Roofs may be classified in **three ways**, according to:

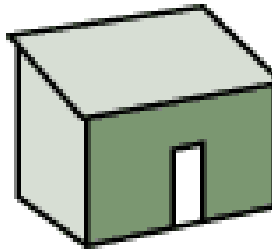
1. The **plane of the surface**, i.e. whether it is horizontal / flat or pitched.
2. The **structural principles of the design**, i.e. the manner in which the forces set up by external loads is resolved within the structure.
3. The span.



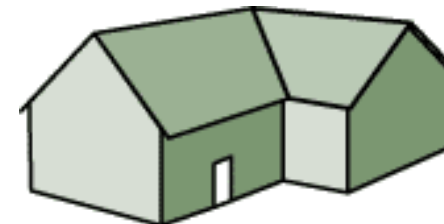
1. Front gable roof



3. Mansard roof



5. Shed roof



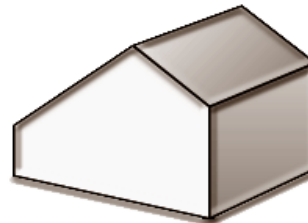
7. Cross gable roof



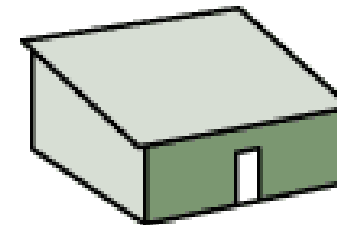
2. Gambrel roof



4. Hip roof



6. Salt Box roof



8. Flat roof

THE END

Assignment One

1. Jot down the Architectural symbols and their representation on;

- a) Plan
- b) Section
- c) elevation

7. VERTICAL CIRCULATION SYSTEMS

Circulation, as usually applied in architecture, is **the movement** of **people** and **goods** between **interior spaces** in buildings and to entrances and exits.

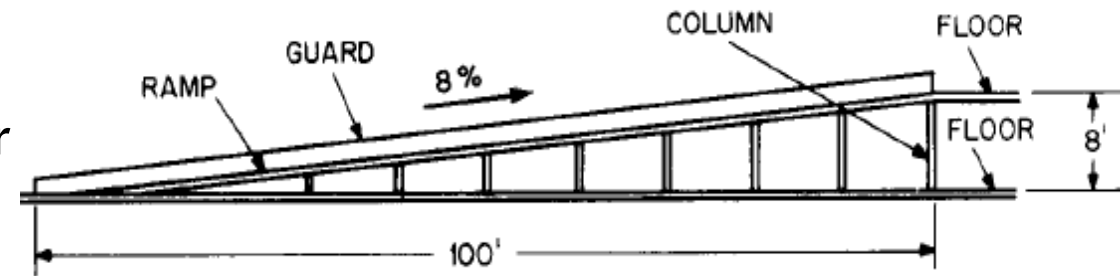
Safe, convenient, rapid circulation is essential for all buildings under both **normal** and **emergency** conditions.

Such **circulation** may be **channeled** through any of several different types of passageways, such as;

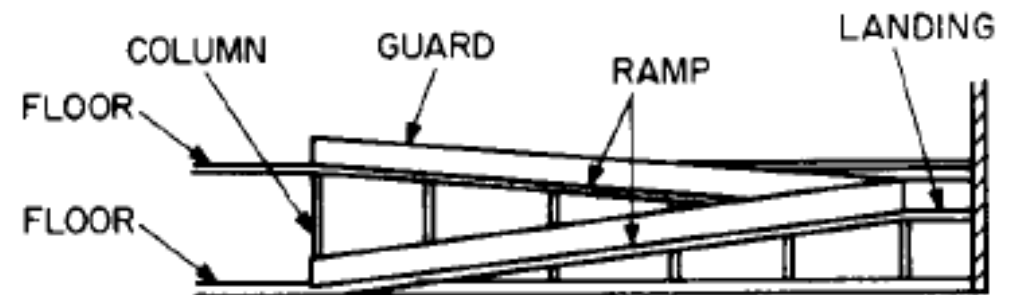
- i. lobbies, and corridors,
- ii. ramps,
- iii. stairways, and
- iv. Elevator and lifts

7.1. RAMPS

- When space permits, a **sloping surface**, or ramp, can be used to connect different levels or floors.
- As a means of **saving space** in some garages, every floor serves as a ramp.
- Ramps are especially useful when **large numbers of people** or **vehicles** have to be moved from **floor** to floor.
- Ramps have been built with slopes up to **15%** (**15 ft in 100 ft**),



(a) Straight ramp



(b) zigzag ramp

7.2. STAIRS

STAIRS

“A Stair is a **system of steps** by which **people and objects** may pass from **one level** of a building to another.”

A stair is to be **designed to span** large **vertical distance** by dividing it into **smaller vertical distances**, called steps.



LOCATION OF STAIRS

- a) It should be so located as to **provide easy access to the occupants** of the building.
- b) It should be so located that it is **well lighted and ventilated** directly from the exterior.
- c) It should be so located as to have approaches **convenient and spacious**.
- d) In public building it should be **located near main entrance** and in residential building it should be **placed centrally**.



SIZES OF STAIRS AND ITS PARTS

Following proportions are recommended:

(i) Residential buildings- Tread=250 mm

Rise=160 mm

(ii) Public buildings - Tread=300 mm

Rise=150 mm

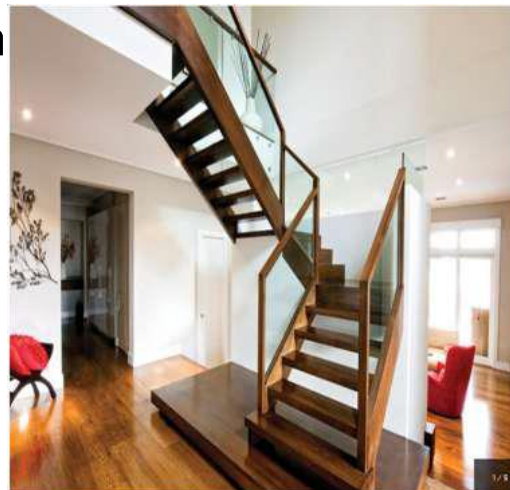
(iii) Industrial buildings, Railway station

etc Tread =not less than 250 mm

=250 to 300 mm

Rise =not less than 150 mm

=150 to 190 mm



7.2. STAIRS

Types of Stairs

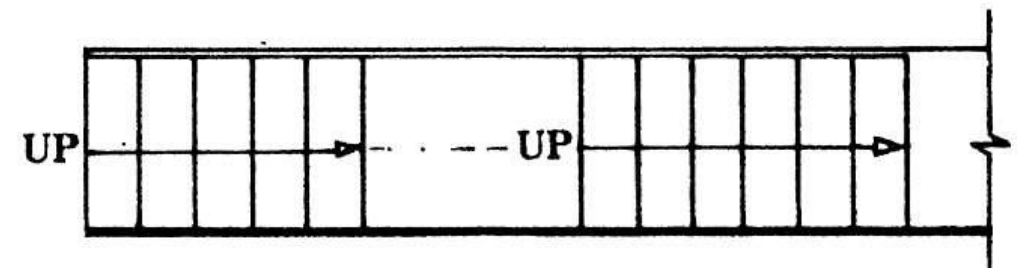
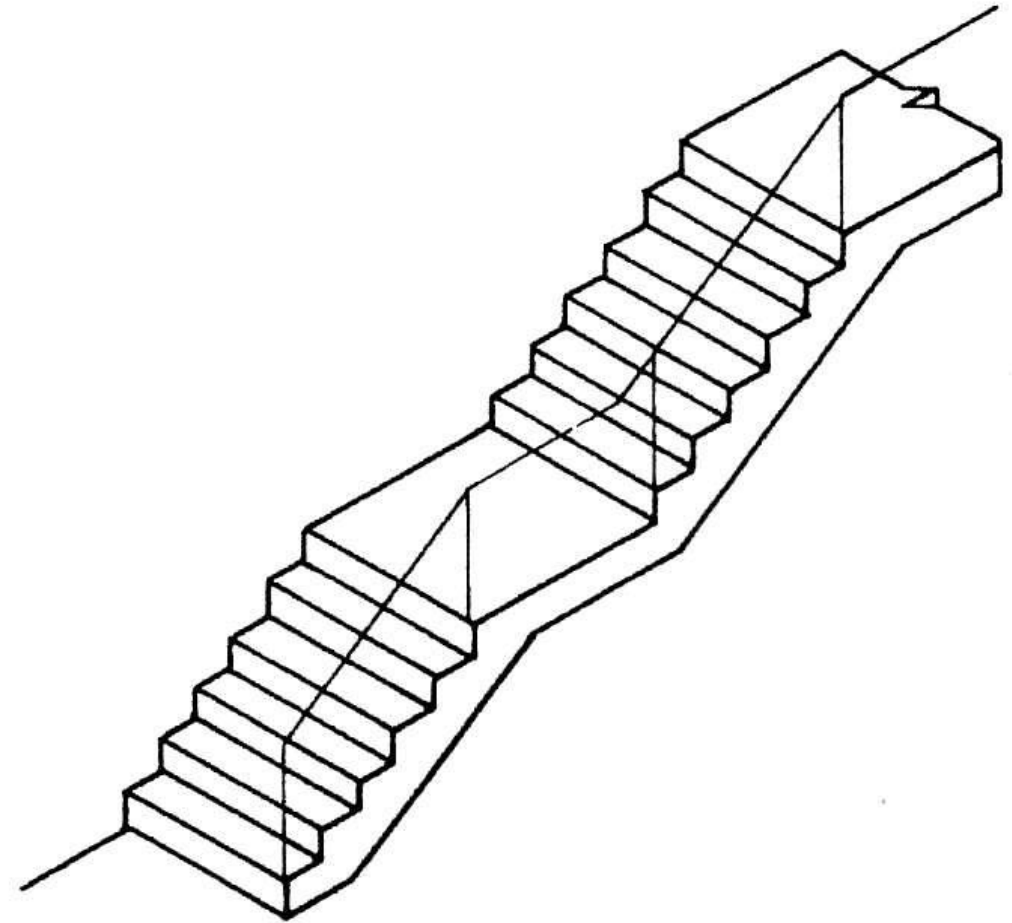
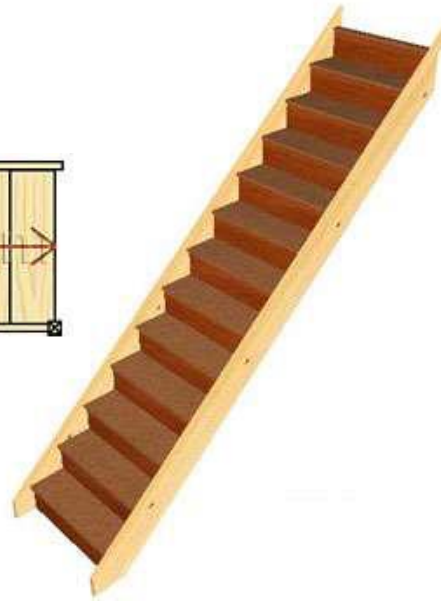
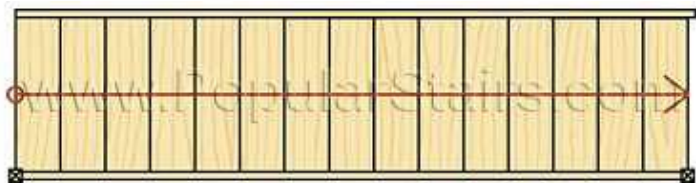
Generally, stairs are of the following types:

- i. straight,
- ii. circular,
- iii. curved, or spiral,
- iv. a combination.



CONT'D

1. **Straight stairs** are stairs along which there is **no change** in direction on any **flight** between **two successive** floors.

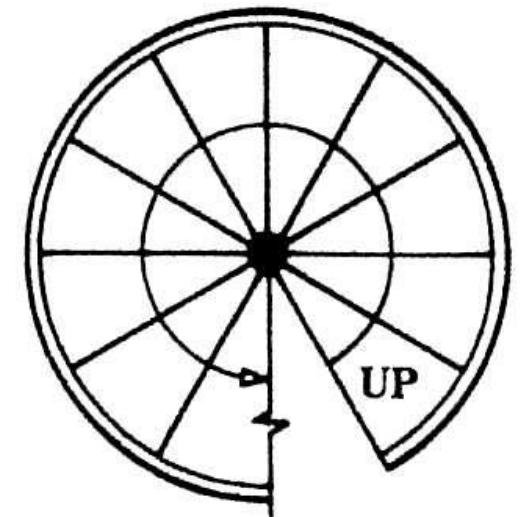
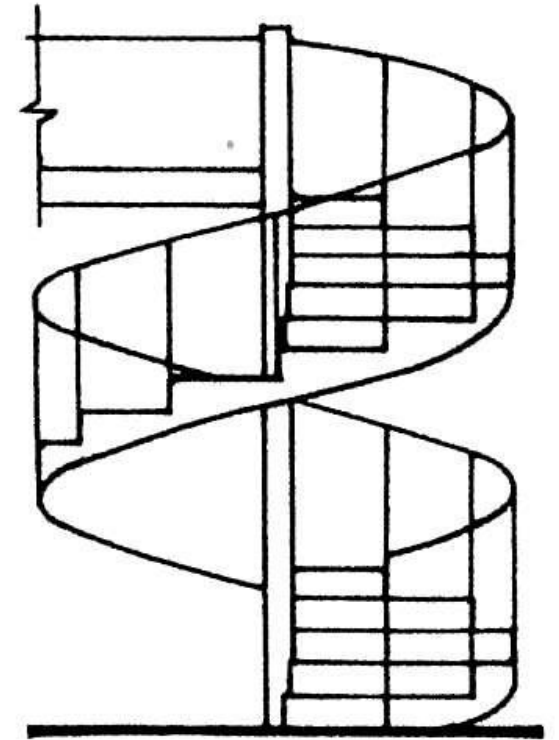


CONT'D

2. Spiral stairs

are similar to circular stairs except that the **radius** of curvature is **small** and the **stairs** may be supported by a center post.

Radius to centre line of stairway not less than 600mm; where radius to centre line is less than 3000mm,

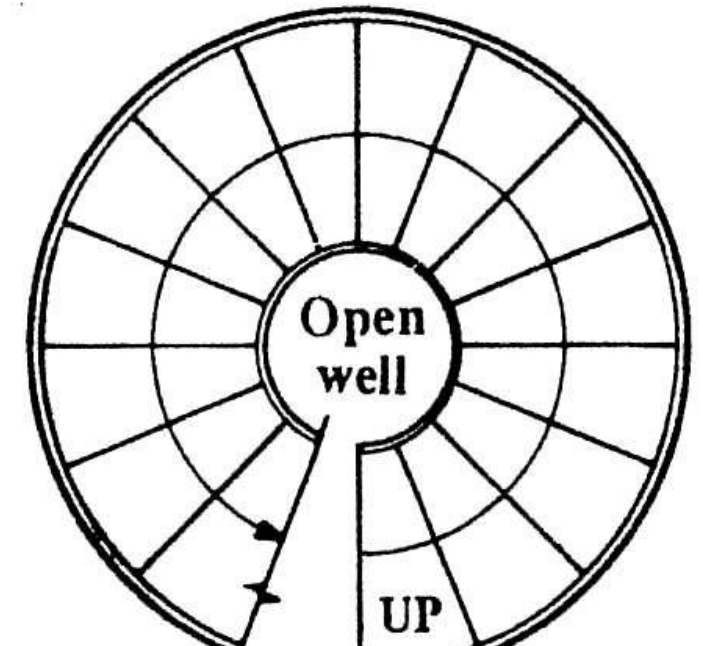
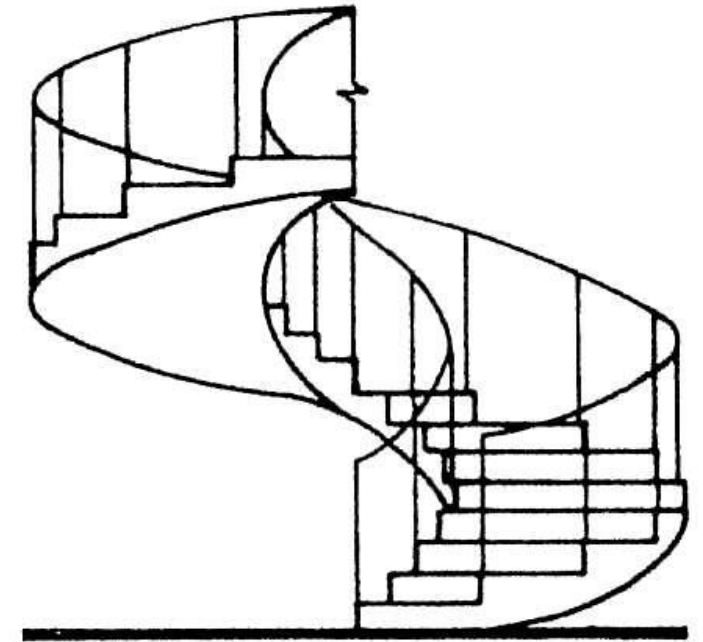


CONT'D

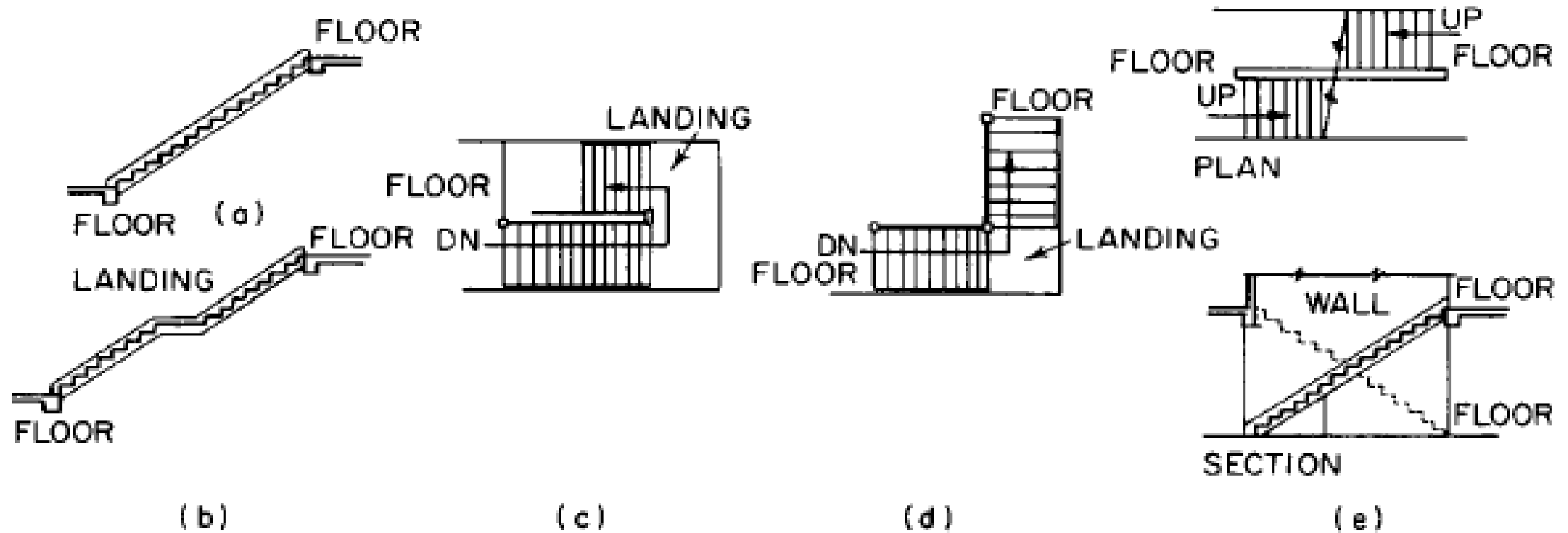
3. Circular stairs

when viewed from above
appear to follow a circle with
a **single center** of curvature
and large radius.

Each Going not less than
215mm & not more than
305mm



CONT'D



Arrangement of straight stairs; a) single flight b) flight without change in direction c) parallel stairs d) angle stair e) scissors stairs

CONT'D

Stairway Components

Among the principal components of a stairway are

- a) **Flight.** A series of **steps extending** from **floor to floor**, or from **a floor to an intermediate landing** or platform.
- b) **Guard.** Protective **vertical barrier** along **edges** of stairways, **balconies**, and **floor** openings.
- c) **Landings (platforms).** Used where **turns are necessary** or to break up long climbs. Landings should be level, as wide as the **stairs**, and at **least 44** in long in the direction of travel.

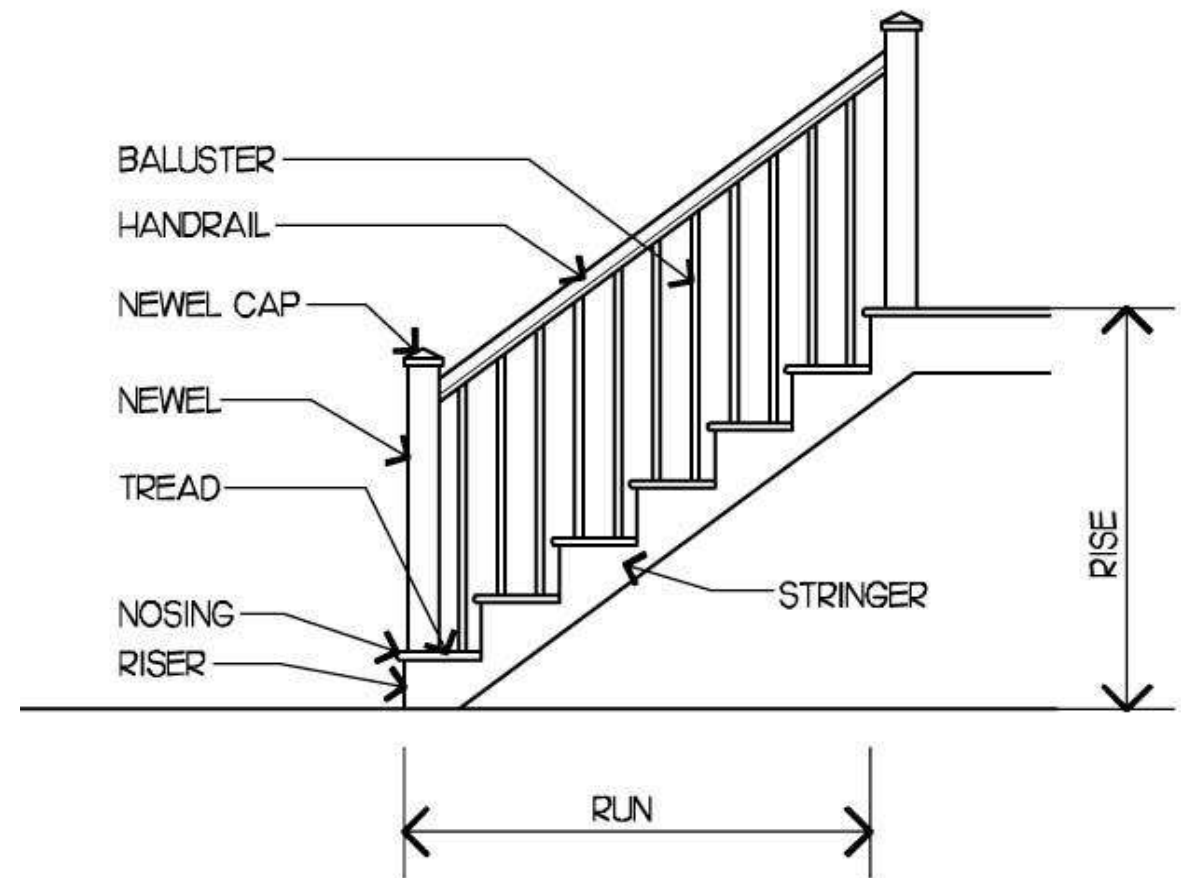
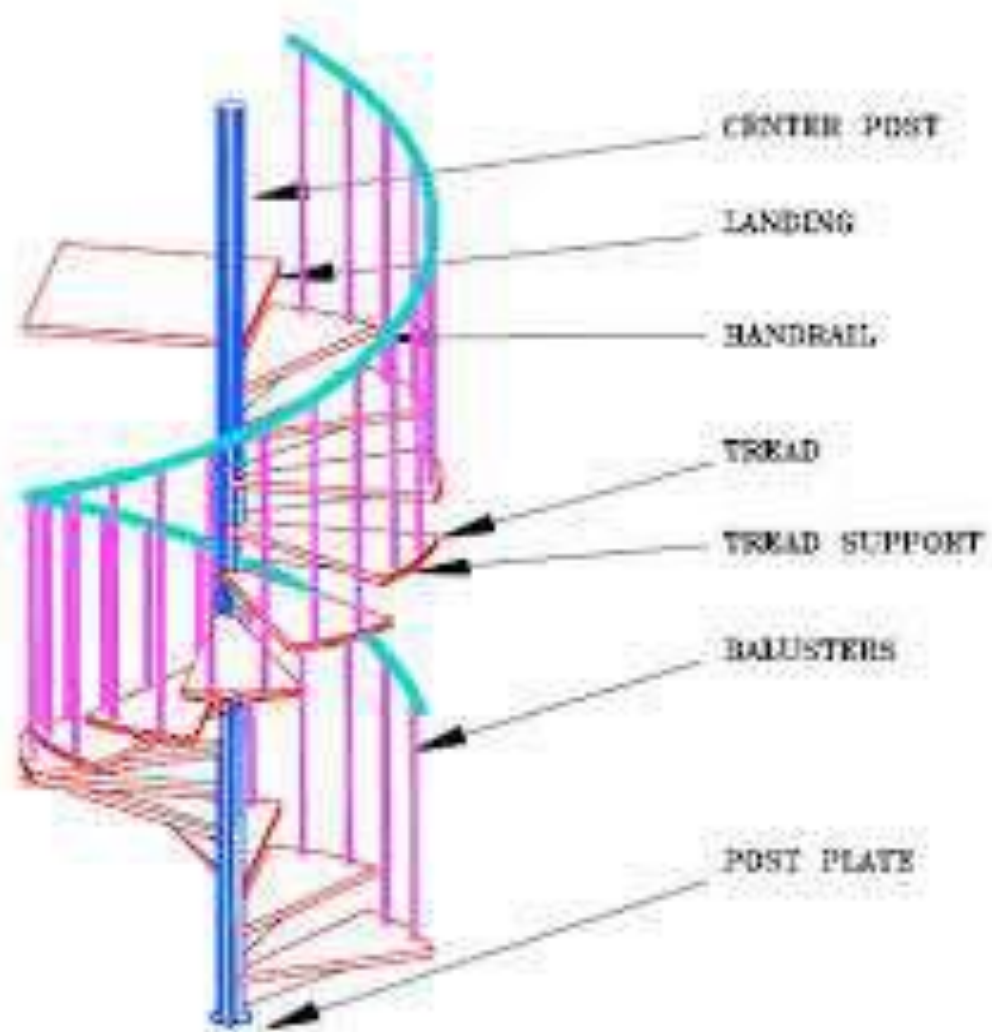
CONT'D

- a) **Step.** Combination of a **riser** and the **tread immediately** above.
- b) **Rise.** Distance from **floor to floor**.
- c) **Run.** Total **length of stairs** in a **horizontal plane**, including **landings**.
- d) **Riser.** **Vertical face** of a step. Its height is generally taken as the **vertical distance** between treads.
- e) **Tread.** **Horizontal face** of a step. Its width is usually taken as **the horizontal distance** between risers.
- f) **Nosing.** Projection of a **tread** beyond the **riser** below.
- g) **Header.** Horizontal **structural member** supporting stair stringers or landings.

CONT'D

- a) **Railing.** Framework or **enclosure supporting** a handrail and serving as a **safety barrier**.
- b) **Baluster.** **Vertical member** supporting the **handrail** in a railing.
- c) **Balustrade.** A railing composed of **balusters capped** by a handrail.
- d) **Handrail.** Protective **bar placed** at a convenient distance above **the stairs** for a **handhold**.
- e) **Newel Post.** Post at which the **railing terminates** at each floor level.
- f) **Angle Post.** Railing support at landings or other **breaks in the stairs**.

CONT'D



CONT'D

Stair **safety and geometry** are related- rhythmic movement along a **straight line** is important for safe ascent or descent

