**BASIC TECHNOLOGY JSS 3**

**SECOND TERM**

## SCHEME OF WORK

Week 1; revision of last terms work

Week 2; building components [foundation]

Week 3; windows, doors and roofs

Week 4; wood work project

Week 5; wood work project

Week 6; metal joining

Week 7; metal work project

Week 8; motion in engineering

Week 9; simple electrical wiring

Week 10; wiring tools and materials

Week 11; revision

Week 12; examination

Week 1; Revision

**Wood Processing**

The primary categories of wood products include sawn timber, wood-based panels, wood chips, paper and paper products, and miscellaneous items like poles and railway sleepers. Over the past few decades, there have been significant advancements in forest product processing technologies, particularly in areas such as recovery rates, durability, and protection. Progress has not been uniform across all categories; while some sectors have experienced innovations, others, especially sawmilling, have lagged behind.

Several factors have contributed to these developments and stagnations, including decreasing raw material supply, reduced availability of large-sized timber, increased environmental pressures, and government policies promoting domestic wood-based industries. Government support has led to a substantial increase in processing plants and product diversification. The decline of the traditional sawnwood sector and plywood sector can be attributed to wood supply reductions and competition with more cost-effective alternatives like Medium Density Fibreboard (MDF).

Medium Density Fibreboard Production

MDF production has seen significant growth due to raw material shortages and the utilization of untapped resources. Various raw materials, including radiata pine, mixed tropical species, rubberwood, bagasse, and cotton stalks, are used in MDF production. Malaysia, for instance, primarily utilizes rubberwood, owing to its uniform texture and light color, making it ideal for MDF production.

The production process involves debarking, chipping, cooking, refining into wood fibers, mixing with resin and wax, drying, and forming a continuous mat. MDF and Oriented Strandboard (OSB) have become competitive alternatives to traditional products like plywood and particleboard. Their production costs are significantly lower, and they can be manufactured from low-quality raw materials.

Rubberwood Success Story in Malaysia

Rubberwood, once considered of negligible value due to its rapid biodegradation and susceptibility to insect infestations, has gained prominence in Malaysia. Research and development efforts, coupled with strategic marketing, have led to its successful utilization. Rubberwood, primarily sourced from plantations established for latex production, has outperformed many traditional light-colored species in the furniture industry. The growth of the MDF sector in Malaysia is also attributed to the abundance of rubberwood.

Oil Palm Fiber as an Alternative Raw Material

With the depletion of rubberwood supply, the industry is exploring alternative raw materials. Oil palm, increasingly replacing rubber plantations, presents a viable option. Research is underway to use oil palm fibers in various wood-based boards, pulp and paper, mushroom cultivation, and animal feed. The quality of fiberboard made from oil palm empty fruit bunches rivals that of rubberwood particleboard.

Outlook

Technological advancements in wood processing are driven by diminishing raw material supplies, particularly large-sized logs. Wood-based panel products have evolved rapidly, with a shift from plywood to particleboard and MDF. Reconstituted panel production offers higher recovery rates and the utilization of various raw materials, reducing waste and maximizing efficiency.

In the future, the industry's dependence on large-sized timber will decrease further, leading to increased focus on secondary forests and plantations. Reconstituted wood-panels will continue to gain momentum, driven by marketing strategies and the growing middle-class demand for furniture.

Assignment

1. Define Wood Seasoning: Wood seasoning refers to the process of drying timber to reduce its moisture content, making it suitable for various applications. Proper seasoning enhances wood's stability, strength, and durability, ensuring it can be used effectively in construction, furniture making, and other industries.

2. Define Wood Conversion: Wood conversion encompasses the transformation of raw timber into different products, such as lumber, plywood, and paper. It involves various processes, including sawmilling, chipping, and pulping, to create materials suitable for specific applications. Wood conversion plays a crucial role in the woodworking and paper industries, enabling the utilization of wood resources in diverse sectors.

Week 2; building components [foundation]

A **foundation** (or, more commonly, **base**) is the element of an architectural structure which connects it to the ground, and transfers loads from the structure to the ground. Foundations are generally considered either shallow or deep.[1] Foundation engineering is the application of soil mechanics and rock mechanics (Geotechnical engineering) in the design of foundation elements of structures.

## Historic foundation types

[](https://en.wikipedia.org/wiki/File:Loty%C5%A1sk%C3%A9_etnografick%C3%A9_muzeum_v_p%C5%99%C3%ADrod%C4%9B_(91).jpg)

The simplest foundation, a padstone. Latvian Ethnographic Open Air Museum

### Earthfast or post in ground construction

Buildings and structures have a long history of being built with wood in contact with the ground.[2][3] Post in ground construction may technically have no foundation. Timber pilings were used on soft or wet ground even below stone or masonry walls.[4] In marine construction and bridge building a crisscross of timbers or steel beams in concrete is called grillage.[5]

### Padstones

Perhaps the simplest foundation is the padstone, a single stone which both spreads the weight on the ground and raises the timber off the ground.[6] Staddle stones are a specific type of padstones.

### Stone foundations

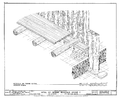
Dry stone and stones laid in mortar to build foundations are common in many parts of the world. Dry laid stone foundations may have been painted with mortar after construction. Sometimes the top, visible course of stone is hewn, quarried stones.[7] Besides using mortar, stones can also be put in a gabion.[8] One disadvantage is that if using regular steel rebars, the gabion would last much less long than when using mortar (due to rusting). Using weathering steel rebars could reduce this disadvantage somewhat.

### Rubble trench foundations

Main article: Rubble trench foundation

Rubble trench foundations are a shallow trench filled with rubble or stones. These foundations extend below the frost line and may have a drain pipe which helps groundwater drain away. They are suitable for soils with a capacity of more than 10 tonnes/m² (2,000 pounds per square foot).

## Gallery of shallow foundation types

* [](https://en.wikipedia.org/wiki/File:Drawing_of_Poteaux-en-Terre_in_the_Beauvais_House_in_Ste_Genevieve_MO.png)

Drawing of Poteaux-en-Terre post in ground type of wall construction (this example technically called pallisade construction) in the Beauvais House in Ste Genevieve, Missouri, U.S.A.

* [](https://en.wikipedia.org/wiki/File:PSM_V24_D321_A_primitive_lake_dwelling_in_switzerland.jpg)

PSM V24 D321 A primitive stilt house in Switzerland on wood pilings.

* [](https://en.wikipedia.org/wiki/File:H%C3%B3rreo_tipo_asturiano,_O_Piornedo,_Cervantes.jpg)

A granary on staddle stones, a type of padstone

* [](https://en.wikipedia.org/wiki/File:Black_Eagle_Dam_-_cross-section_of_construction_plans_for_1892_structure.jpg)

Black Eagle Dam - cross-section of construction plans for 1892 structure

* [](https://en.wikipedia.org/wiki/File:Davis_House_stone_foundation_ruin,_Gardiner,_NY.jpg)

Davis House dry-laid stone foundation ruin, Gardiner, NY

* [](https://en.wikipedia.org/wiki/File:Random_rubble_masonry1.jpg)

A basic type of rubble trench foundation

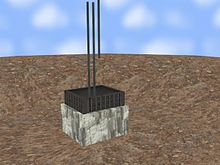
* [](https://en.wikipedia.org/wiki/File:Concrete_cellar_10007.JPG)

Typical residential poured concrete foundation, except for the lack of anchor bolts. The concrete walls are supported on continuous footings. There is also a concrete slab floor. Note the standing water in the perimeter French drain trenches.

## Modern foundation types

### Shallow foundations

Main article: Shallow foundation

Play media

Shallow foundation construction example

**Shallow foundations**, often called **footings**, are usually embedded about a metre or so into soil. One common type is the spread footing which consists of strips or pads of concrete (or other materials) which extend below the frost line and transfer the weight from walls and columns to the soil or bedrock.

Another common type of shallow foundation is the slab-on-grade foundation where the weight of the structure is transferred to the soil through a concrete slab placed at the surface. Slab-on-grade foundations can be reinforced mat slabs, which range from 25 cm to several meters thick, depending on the size of the building, or post-tensioned slabs, which are typically at least 20 cm for houses, and thicker for heavier structures.

### Deep foundations

Main article: Deep foundation

A **deep foundation** is used to transfer the load of a structure down through the upper weak layer of topsoil to the stronger layer of subsoil below. There are different types of deep footings including impact driven piles, drilled shafts, caissons, helical piles, geo-piers and earth stabilized columns. The naming conventions for different types of footings vary between different engineers. Historically, piles were wood, later steel, reinforced concrete, and pre-tensioned concrete.

#### Monopile foundation

Main article: Monopile foundation

A **monopile foundation** is a type of deep foundation which uses a single, generally large-diameter, structural element embedded into the earth to support all the loads (weight, wind, etc.) of a large above-surface structure.

A large number of monopile foundations[9] have been utilized in recent years for economically constructing fixed-bottom offshore wind farms in shallow-water subsea locations.[10] For example, a single wind farm off the coast of England went online in 2008 with over 100 turbines, each mounted on a 4.74-meter-diameter monopile footing in ocean depths up to 16 metres of water.[11]

## Design

[](https://en.wikipedia.org/wiki/File:Stompwijkseweg_68-70,_Stompwijk,_Netherlands.JPG)

Inadequate foundations in muddy soils below sea level caused these houses in the Netherlands to subside.

Foundations are designed to have an adequate load capacity depending on the type of subsoil supporting the foundation by a geotechnical engineer, and the footing itself may be designed structurally by a structural engineer. The primary design concerns are settlement and bearing capacity. When considering settlement, total settlement and differential settlement is normally considered. Differential settlement is when one part of a foundation settles more than another part. This can cause problems to the structure which the foundation is supporting. Expansive clay soils can also cause problems.

Walls in Building Construction

Walls in buildings serve a multitude of purposes, primarily supporting roofs, floors, and ceilings. They enclose spaces within the building envelope, offering structure and security. Additionally, walls house utilities such as electrical wiring and plumbing. Wall construction is broadly categorized into two types: framed walls and mass walls.

Framed Walls: These walls transfer loads to the foundation through posts, columns, or studs. Typically, they consist of structural elements like 2×4 studs, insulation, and finish elements such as drywall or paneling.

Mass Walls: Mass walls are made of solid materials like masonry, concrete (including slipform stonemasonry), log building, cordwood construction, adobe, rammed earth, cob, earthbag construction, bottles, tin cans, straw-bale construction, and ice.

There are three fundamental methods to control water intrusion in walls:

1. Moisture Storage: Common in stone and brick mass-wall buildings, moisture is absorbed and released by the walls themselves.

2. Drained Cladding: Also known as screened walls, this method accepts moisture penetration, but a moisture barrier like housewrap or felt paper inside the cladding provides a second line of defense. Sometimes, a drainage plane or air gap allows moisture to drain down and exit the wall.

3. Face-sealed Cladding: This method relies on maintaining a leak-free surface. Examples include early exterior insulation finishing systems, structural glazing, metal-clad panels, and corrugated metal.

Walls in buildings often transcend their functional roles and become works of art. They can feature mosaic work, murals, various textures, or painted finishes, enhancing both external and internal aesthetics.

Curtain Wall:

In architecture and civil engineering, a curtain wall refers to a building facade that isn't load-bearing but serves decorative, finishing, or historical preservation purposes.

### Precast Compound Wall:

### Precast compound walls are ready to use and offer fast installation compared to brick walls. They are also cost-effective alternatives.

### Mullion Wall:

### Mullion walls employ a structural system that carries the load of the floor slab on prefabricated panels around the perimeter.

### Murno Gladst Wall:

### A Murno Gladst Wall, also known as a Murno Gladst Fence, is a tall, deep-base exterior security wall designed to deter intrusion by climbing and tunneling.

### Partition wall

[](https://en.wikipedia.org/wiki/File:Glass_Partition_Wall.jpg)

**Glass Partition Walls**

A partition wall serves the purpose of dividing or separating rooms within a building. Typically, these walls are not load-bearing and can be constructed using various materials such as steel panels, bricks, clay blocks, concrete, or even glass blocks.

Glass partition walls consist of individual toughened glass panels that are mounted within wooden or metal frames. These panels can be suspended from a robust aluminum ceiling track or designed to slide along it. Unlike some systems, they do not require a floor guide, allowing for effortless operation and an uninterrupted threshold.

Wooden frameworks form timber partitions, either supported by the floor or side walls. Metal lath and plaster, when correctly laid, create sturdy partition walls. Fiber cement backer boards are popular choices for partition bases, especially in areas prone to moisture, such as kitchens or bathrooms. Galvanized sheets fixed onto wooden or steel frames are often used for temporary constructions. Additionally, plain or reinforced partition walls can be made from concrete, including pre-cast concrete blocks. Metal-framed partitions are also available, comprising tracks (primarily at the base and head of the partition) and studs (vertical sections fixed into the track, usually spaced at 24", 16", or 12").

Internal wall partitions, commonly known as office partitioning, are often made from plasterboard (drywall) or various types of glass. Toughened glass and low-iron glass (opti-white glass) are popular choices due to their ability to enhance light transmission. These partitions are constructed using beads and tracking, either suspended from the ceiling or fixed into the ground. Panels are inserted into the tracking and securely fixed. Certain wall partition designs specify their fire resistance and acoustic performance ratings.

**Types of Walls in Construction**

1.Party Wall:

Party walls separate buildings or units within a building, providing fire resistance and sound insulation between occupants. These walls are not load-bearing and may be owned by different individuals.

2. Infill Wall:

An infill wall is a supported wall that encloses the perimeter of a building constructed with a three-dimensional framework structure.

3. Fire Wall:

Fire walls resist the spread of fire within or between structures, offering passive fire protection. These walls, made of non-combustible materials like concrete, brick, or fire-rated drywall, contain no windows and have sealed wall penetrations. Fire doors are essential components in fire walls. They vary in resistance, lasting from one to four hours.

4. Shear Wall:

Shear walls resist lateral forces caused by earthquakes or severe winds. Various types, such as steel plate shear walls, are used to provide structural stability.

5. Knee Wall:

Knee walls are short walls that support rafters or add height in the top floor rooms of houses, especially in 1 1⁄2-story houses, where they support the half story.

6. Cavity Wall:

Cavity walls consist of two skins with a space between them, inhibiting heat transfer and improving insulation.

7. Pony Wall:

A pony wall, also known as a dwarf wall, is a general term for short walls that may be a half wall without structural support, a stem wall extending from the foundation slab to the cripple wall or floor joists, or a cripple wall, a framed wall between the stem wall or foundation slab and the floor joists.

Week 3; windows

# Window

From Wikipedia, the free encyclopedia

This article is about the part of a building. For the graphical user interface element, see Window (computing). For the operating system, see Microsoft Windows. For other uses, see Window (disambiguation) and Windows (disambiguation).

[](https://en.wikipedia.org/wiki/File:Window_Porto_Covo_August_2013-2.jpg)

Window of traditional design in Porto Covo, Portugal

[](https://en.wikipedia.org/wiki/File:SumburghHeadLighthouseWindows.jpg)

Cylindrical lattice window of Sumburgh Head Lighthouse (Shetland).

A window serves as an opening in a wall, door, roof, or vehicle, facilitating the passage of light, sound, and air. Modern windows are typically glazed or covered with transparent materials, set within a frame. This ensemble of sash and frame constitutes a window. Many glazed windows are designed to be opened for ventilation or closed to shield against adverse weather conditions. Windows are often equipped with latches or similar mechanisms to secure them shut or hold them open at various degrees.

Various types of windows exist, including eyebrow windows, fixed windows, single-hung and double-hung sash windows, horizontal sliding sash windows, casement windows, awning windows, hopper windows, tilt and slide windows (often door-sized), tilt and turn windows, transom windows, sidelight windows, jalousie or louvered windows, clerestory windows, skylights, roof windows, roof lanterns, bay windows, oriel windows, thermal, or Diocletian, windows, picture windows, emergency exit windows, stained glass windows, French windows, panel windows, and double- and triple-paned windows.

Historically, the Romans were pioneers in using glass for windows, a technology likely first developed in Roman Egypt around 100 AD. Paper windows were prevalent in ancient China, Korea, and Japan. In England, ordinary homes started incorporating glass windows only in the early 17th century. However, windows made of panes of flattened animal horn were in use as early as the 14th century. In the 19th century American West, itinerant groups employed greased paper windows. The advent of modern-style floor-to-ceiling windows became feasible only after perfecting industrial plate glass making processes.

In the realm of Building Construction, doors and windows play pivotal roles. They serve as openable barriers or frameworks made from materials such as wood, steel, aluminum, or glass, securing wall openings. The functions of doors include providing access to the interior of a building, connecting different internal sections, ensuring lighting and ventilation, controlling the atmosphere within a space, acting as a noise barrier, and segregating formal and utility areas.

Regarding the location of doors in a building, their number should be minimized while meeting functional requirements. Ideally, doors are positioned at room corners, approximately 20 cm from the corner. In rooms with more than two doors, they should face each other. Doors consist of components like the door frame, which comprises horizontal and vertical members where door shutters are affixed. Jambs or posts are the vertical members, the top horizontal member is known as the head, and horizontal projections of the head are referred to as horns. A rebate cut of approximately 12 mm surrounds the frame to accommodate the door shutter.

Door dimensions adhere to common width-height ratios, where width ranges from 0.4 to 0.6 times the height. General sizes for residential external doors are 1.0 x 2.0 to 1.1 x 2.0 meters, internal doors measure 0.9 x 2.0 to 1.0 x 2.0 meters, and dimensions for bath & WC doors range from 0.7 x 2.0 to 0.8 x 2.0 meters. Garage doors for cars typically measure between 2.25 x 2.25 meters to 2.40 x 2.25 meters. Public buildings often employ doors measuring 1.2 x 2.0 meters, 1.2 x 2.1 meters, or 1.2 x 2.25 meters.

Door frames can be constructed using various materials such as timber, steel, aluminum, concrete, or stone. The materials for shutters encompass timber, plywood, glass, or block. Door frames are assemblies of horizontal and vertical members that create an enclosure for door shutters. Vertical members are referred to as jambs or posts, with the top horizontal member known as the head. The horizontal projections of the head are termed horns. To receive the door shutter, a rebate cut of about 12 mm is provided around the frame.

Doors can be categorized based on their working operations. Hinged doors, the most common type, pivot along one side to open and close. Revolving doors, often found in public buildings, consist of multiple wings/leaves that rotate around a central shaft, allowing people to enter or exit simultaneously. Sliding doors slide horizontally along tracks and are popular in places with limited space. Swing doors are fitted with special double-action hinges, enabling movement in both inward and outward directions. Folded doors comprise narrow vertical strips that fold back into a compact bundle, saving space. Collapsible doors, resembling steel curtains, provide increased safety and protection. Rolling shutters, made of thin steel slabs, act as curtains and offer protection against fire and theft.

Other door types include battened and ledged doors, which consist of vertical boards nailed or screwed to horizontal ledges, often equipped with braces to prevent sagging. Framed and paneled doors consist of a frame with stiles, top rail, and intermediate rails, covered by plywood panels. Glazed or sash doors incorporate glass panels within the frame. Louvered doors feature styles grooved to receive louvers, permitting free ventilation while maintaining privacy. Wire gauged doors prevent insects from entering, allowing air circulation. Metal-covered plywood doors, composed of plywood and mild steel, offer reasonable fireproofing.

In the realm of windows, they function as openings allowing light, sound, and air passage. Modern windows are often glazed and set within frames. They come in various types, including pivoted windows

Sliding doors operate along metal, wood, or vinyl tracks integrated into their frames at the top and bottom. These doors are facilitated by plastic rollers attached to the top and bottom or solely to the bottom for smooth movement. The door is suspended by two trolley hangers at the top, running in a concealed track, while rollers at the bottom slide the shutter within a channel track.

Swing doors employ special double-action hinges to attach the shutter to its frame. These hinges enable movement inward and outward. The doors lack rebates at the meeting styles. To open, a slight push initiates the movement, and the spring action brings the shutter into a closed position, necessitating caution due to the forceful return.

Folded doors consist of narrow vertical strips or creases that fold back into a compact bundle when pushed open. These strips or creases hang from the top and run on a track, saving space. Although they do not swing out of the door opening, they tend to be noisy, and their sound and weather isolation are limited.

Collapsible doors, found in garages, workshops, and public buildings, enhance safety and property protection. These doors do not require hinges for operation. They resemble a steel curtain and are constructed from vertical double channels jointed together with hollows on the inside, allowing movement facilitated by diagonal iron flats. Rollers mounted at the top and bottom enable smooth operation.

Rolling shutters are commonly used for shops, godowns, and stores, providing adequate protection against fire and theft. The shutter comprises thin steel slabs or laths interlocked and coiled upon a specially designed pipe shaft called a drum. The shutter moves within vertical steel guide channels at its ends. A horizontal shaft and spring in the drum enable coiling and uncoiling. Manual operation is possible for smaller openings, while larger ones require manual operation.

Battened and ledged doors consist of vertical boards nailed or screwed to horizontal ledges. Battens, approximately 15 to 18 cm wide and 2 to 3 cm thick, enhance the door's appearance. Braces are added to prevent sagging, sloping upwards from the hinge edge and housed with a skew notch into the ledges.

Framed and paneled doors comprise a frame with stiles, a top rail, and sometimes an intermediate rail. A plywood panel fits into the framework, either in a groove or rebate. Glazed or Sash Doors offer visibility into a room, while flush doors with a framed core consist of stiles, top and bottom rails, covered on each side by plywood. However, these doors are unsuitable for exposure to rain and sun.

Louvered doors feature grooved styles receiving a series of louvers made of glass or wood slates, providing both ventilation and privacy. Wire gauged doors prevent insects from entering, allowing air circulation. Metal-covered plywood doors are composite doors made of plywood and mild steel, offering reasonable fire resistance.

Concerning windows, recommended dimensions vary based on specific requirements. Single or double shutter windows, categorized as WS (Window opening with a single shutter) or WT (Window opening with double shutters), come in different sizes to accommodate diverse needs.

Various window types serve different purposes, including Pivoted Windows, Double-Hung Windows, Sliding Windows, Casement Windows, Glazed Windows, Louvered Windows, Metal Windows, Bay Windows, Clerestory Windows, Corner Windows, Dormer Windows, Awning Windows, and Skylights.

Fixed windows have permanently fixed glass panes, limited to providing light and allowing vision. Pivoted windows rotate about a fixed pivot, while double-hung windows consist of two sliding panes. Single-hung windows have only the bottom sash movable. Sliding windows have multiple sashes sliding horizontally within the frame.

Casement windows open outward and function like hinged doors, offering maximum ventilation. Glazed windows have fully glazed panels. Louvered windows, with grooved styles, accommodate louvers for ventilation without compromising privacy. Metal windows, commonly made of mild steel, offer affordability and durability.

Bay windows project outward, providing a wide view and enhancing aesthetics. Clerestory windows are positioned at the top of the main roof, offering additional light and ventilation. Corner windows, positioned at room corners, allow light and air from two directions. Dormer windows and gable windows are situated on sloping roofs to provide light and ventilation to the enclosed space below.

Awning windows are hinged at the top, opening outward and preventing rain from entering. Skylights, fixed on sloping roofs, distribute natural light evenly and can be energy-efficient if strategically placed.

Various fixtures and fastenings, including hinges, bolts, handles, and locks, are essential components of doors and windows. Hinges come in diverse types like counter flap hinges, parliamentary hinges, nar-madi hinges, gamet hinges, strap hinges, pin hinges, double-acting hinges, and spring hinges. Bolts include AL drop bolts, barrel bolts, flush bolts, espagnolette bolts, and Hspandstaple bolts. Handles, such as bow-type handles, wardrobe handles, lever handles, and door handles, serve as essential door accessories. Locks, such as padlocks, rim locks, mortise locks, cupboard locks, and lever handle locks, ensure security.

This information draws from credible sources, including Dr. R.P. Rethaliya's works on Building Construction.

Week 4&5 ; wood work project

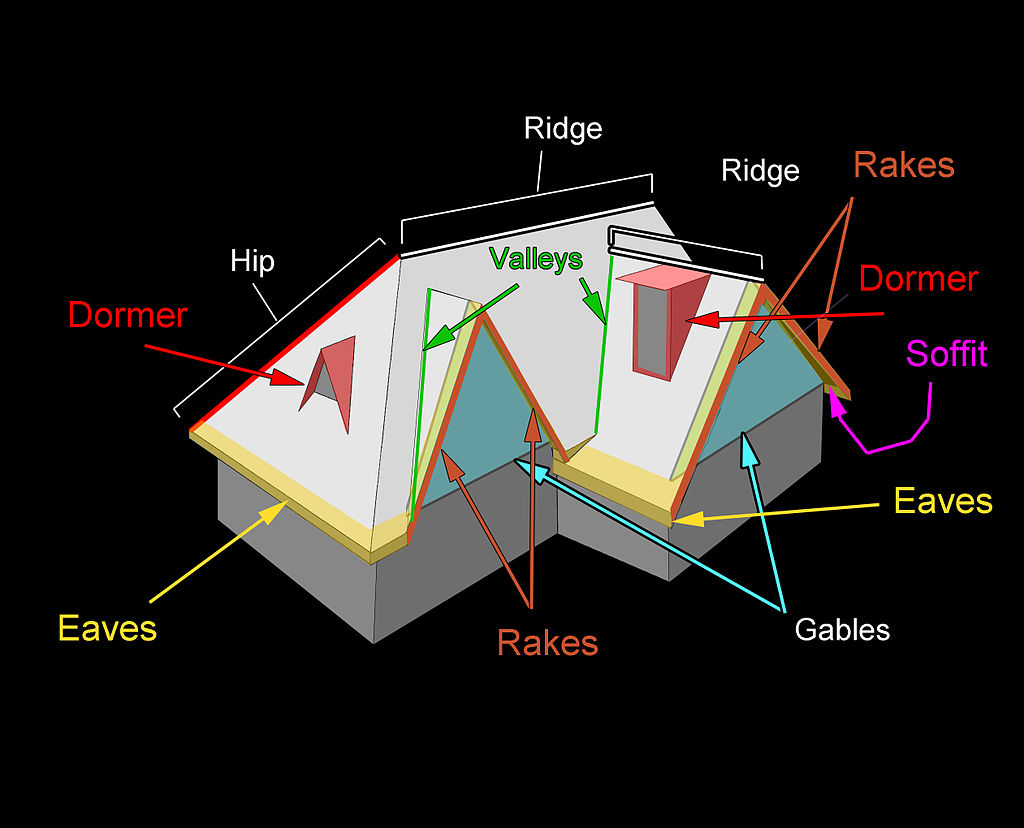
The roofs of San Cristóbal de las Casas, Mexico

[](https://en.wikipedia.org/wiki/File:Antananarivo03.jpg)

Roofs of Antananarivo, Madagascar

A **roof** is part of a building envelope. It is the covering on the uppermost part of a building or shelter which provides protection from animals and weather, notably rain or snow, but also heat, wind and sunlight. The word also denotes the framing or structure which supports that covering.[1]

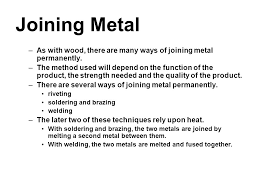
The characteristics of a roof are dependent upon the purpose of the building that it covers, the available roofing materials and the local traditions of construction and wider concepts of architectural design and practice and may also be governed by local or national legislation. In most countries a roof protects primarily against rain. A verandah may be roofed with material that protects against sunlight but admits the other elements. The roof of a garden conservatory protects plants from cold, wind, and rain, but admits light.

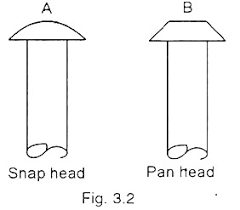


Assignment

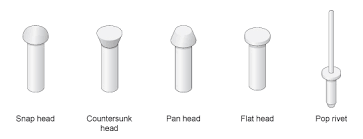
* 1. Define roof
  2. Mention 5 types of roof

Week 6&7; metal joining

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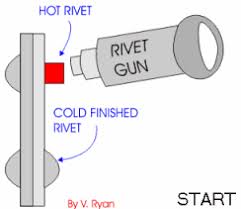
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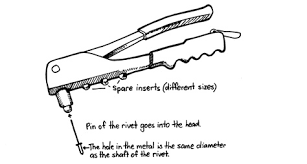
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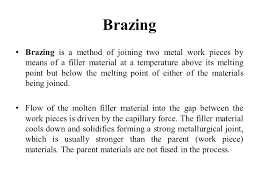
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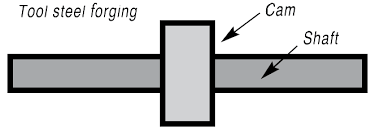
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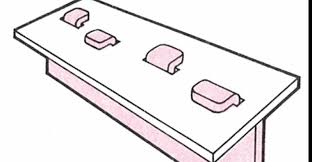
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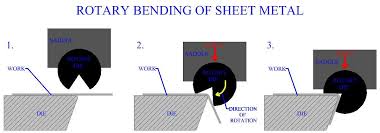
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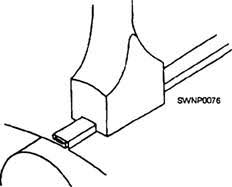
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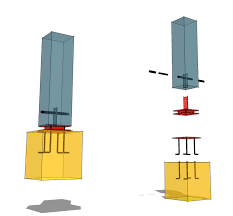
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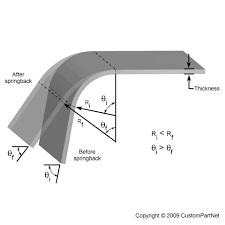
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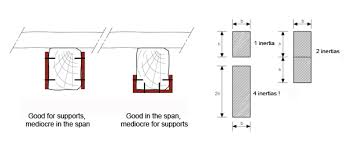
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Assignment

1. Mention 4 methods of joining metal
2. What is riveting

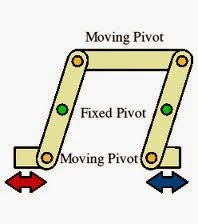
Week 8; motion in engineering

**Definition:**   
Motion can be defined as the movement of a body (object) from one point to another with the application of force.

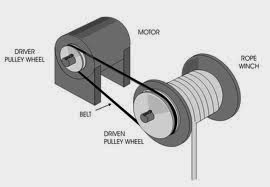
**Types of Motion**

At this level, the two types of motion to be considered are Linear Motion and Rotary Motion.

**Linear Motion:** This is the motion of a body moving in a straight line. For instance, a push-pull link mechanism is a simple machine that operates with linear motion. E.g.

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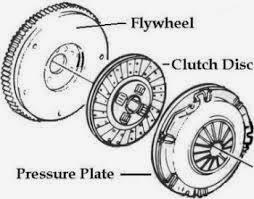
**Rotary Motion:** This is motion of a body moving in a circular form. Examples of circular motion is the rotation of a fan, vehicle tyres, the handle of the clock, etc. e.g.

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**Transmission of Motion**

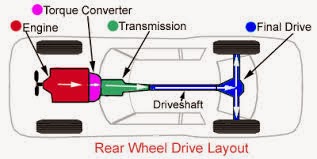
For any engine to function, motion must be transmitted from one part of the engine to other parts. For instance, in a car, motion is often transmitted from the car engine to the wheels. This is possible because of the motion transmission system in the car.  
The transmission system in a car includes the gearbox and the clutch.

**Function of the Clutch:** The function of the clutch is to disconnect two shafts running at different speeds, that is, the engine crankshaft and the gearbox shaft.

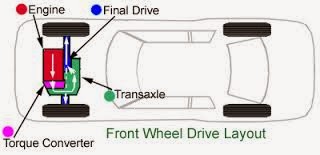
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**Types of Car Engines**

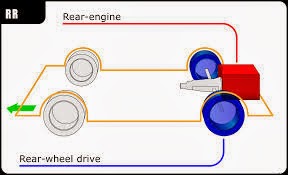
**1.Front- Engine Rear-Wheel Drive:** This is an engine that consists of a clutch, a gear box, a propeller shaft and a rear axle. Most cars in Nigeria operate on this type of engine.

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2. **Front-Engine Front Wheel Drive:** In this type of engine, every other parts mentioned in 1 above is present except for the propeller shaft. Transmission is directly from the gearbox to the rotating wheels.

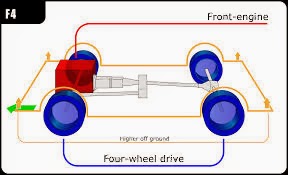
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3. **Rear-Engine Rear-Wheel Drive:** In this type of engine, there is no propeller shaft also. The clutch, engine, gearbox are all engineered at the back of the car. Example is Volkswagen cars.

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4. **Front-Engine 4-Wheel Drive:** This is a more recent technological advancement in the engineering of cars. There is no propeller shaft and most times no mechanical gearbox. The gear system is a hydraulic system. This car contains of the brake and the accelerator only, with all 4 wheels connected to the gear box.

e.g. Mechanical Gear System and Hydraulic Gear System.

[](http://3.bp.blogspot.com/-wW417Bn_iGg/Uw3dbF2DyvI/AAAAAAAAA3E/nb2ETFO7zAY/s1600/images+(9).jpg)

**Control of Rotary Motion-Brakes**Brakes are meant to bring bicycles and cars in motion to a stop. Kinetic energy in a moving object is absorbed by the brake. This produces heat on the brake as kinetic energy is converted into potential energy. As the brake absorbs heat, the vehicle slows down until it finally comes to a stop.

**How Brakes Work**There are different types of brakes. However, the principle of how the brake works is the use of friction. If the brake in a car or bicycle is pressed against the rotating drum or disc or wheel, the resulting friction between the pad and the drum or wheel slows down the rotating wheels, until they eventually come to a stop. E.g.

|  |
| --- |
| [https://4.bp.blogspot.com/-UW1ucNbSZ5Q/Uw3fwo87H0I/AAAAAAAAA3s/V37fIc1JGN8/s1600/images+(12).jpg](http://4.bp.blogspot.com/-UW1ucNbSZ5Q/Uw3fwo87H0I/AAAAAAAAA3s/V37fIc1JGN8/s1600/images+(12).jpg) |
| A Bicycle Brake. |

|  |
| --- |
| [https://3.bp.blogspot.com/-cVhmEy4MMtA/Uw3fwScJplI/AAAAAAAAA3o/MtV2KpXAB58/s1600/images+(11).jpg](http://3.bp.blogspot.com/-cVhmEy4MMtA/Uw3fwScJplI/AAAAAAAAA3o/MtV2KpXAB58/s1600/images+(11).jpg) |
| A Disc Brake. |

**Conversion of Rotary Motion to Linear Motion**

In some machines, it is necessary for a change from one form of motion to another along it’s line of operation. For instance, a sewing machine will need to convert linear motion from the moving pedal to rotary motion at the wheel and finally to linear motion again at the needle.

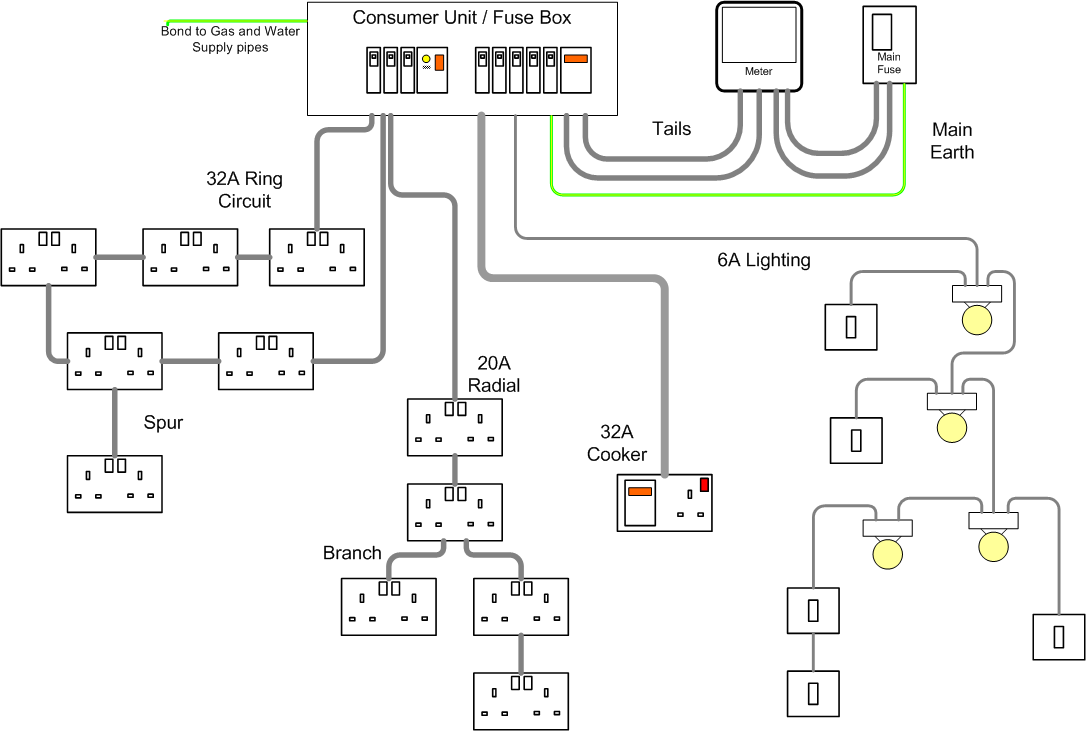
The piston-crank mechanism of a car engine is another example of converting rotary motion at one point of an engine to rotary motion at another point of the same engine. (teacher will explain more). E.g.

Other examples of machines involved in converting one form of energy to another are;  
Screw jack, Rack and piston steering system, Crankshaft and cylinder, Metalwork table vice, Woodworker’s vice, Pipe vice, G-clamp, etc.

assignment

(i) define motion  
ii. list the two types of motions

Week 9; electrical house wiring



Assignment

1. Define house wiring
2. Explain series and parallel wiring

Week 10; tools and materials for house wiring

**Top Electrical Tools List:**

• Pliers

• Screwdrivers and nut drivers

• Wire strippers

• Utility Knife

• Fishing tools

• Measuring devices

• Labeling machines

• Power drills and drivers, hammer/drills

• Power saws

• Voltage Detectors/ Multimeter

**HAND TOOLS**

Every electrician needs basic hand tools to perform everyday tasks. Fortunately, today's basics are better than older models, providing more comfort and safety than their predecessors. Manufacturers have made tools more 'ergonomically correct,' and improved designs help cut down on hand and wrist injuries often caused by repetitive movement. Plus, they make it easier to perform the same motion over and over because the tools just feel more comfortable. While today's designs may provide more safety and comfort, they're still the basic hand tools electricians have been using for years.

**Pliers**

Two of the most common tools an electrician can't work without are side-cutting pliers and long-nose or needle-nose pliers.

side-cutting-pliers



Klein is the most recognized hand tool name in the electrical industry. Top sellers include classic models such as the high-leverage side-cutting pliers for heavy-duty cutting and connector crimping, and six-inch long-nose pliers. Klein's ergonomic Journeyman series pliers are also quite popular. These tools have contoured and cushioned handles that feature a pliable outer surface and hard, black inner material providing a more comfortable grip without sacrificing tool strength and durability. They also have a contoured thumb area and a flared thumb rest that further improves their feel and gripping power.

**Screwdrivers and nut drivers**

Electricians need several screwdrivers and nut drivers to work with various types of fasteners and applications. For electricians who want one tool that adapts to many uses, Klein's 10-in-1 screwdriver/nut driver set with numbers 1 and 2 Phillips; 1/4-inch, 3/16-inch slotted, 5/16-inch and 1/4-inch nut drivers; numbers 10 and 15 TORX; and numbers 1 and 2 square-recess bits. Everything fits into the same chrome-plated, heat-treated shaft with a comfortable cushion-grip handle. Replacement bits are available.



**Wire strippers**

In this category, Ideal Industries' T-Stripper line of wire strippers is a top seller.



They have been an industry standard for almost 50 years. Best sellers are the Reflex wire stripper and the T-Stripper. The Kinetic Reflex T-Stripper is a strong new addition to the line.

Ergonomic designs are one reason for their popularity. Curved handles are designed to fit an electrician's natural grip and reduce repetitive motion fatigue. Non-slip Santoprene textured grips provide more control. A thumb guide promotes comfort while focusing kinetic energy for faster wire stripping.

**Razor Blade Knife (Utility Knife)**

Although some people use utility knifes for things they shouldn't, like stripping their Romex wiring, these tools do come in handy.  You will find you use this tool quite a bit during your wiring project, even if it's just to open boxes.



**Fish tapes and poles**

**Fish tapes:** The Ideal Tuff-Grip line of fish tapes is a strong seller at Graybar.



Handles on impact-resistant cases are large and comfortable, so a secure grip can be maintained, even when wearing work gloves. Tape materials are suited to any type of job.

Fish tapes are used more for conduit/commercial applications.  Not all residential wiring project will require a fish tape.

**Fish poles:** Fish pole wire-installation tools facilitate wire pulling in drop ceilings, down walls or under raised floors. There are several Greenlee models, including the 12- and 24-foot Fish Stix kits and the new 15-foot Glo Stix that glows for better visibility in dark environments. The lightweight design makes them easier to use than heavier models.

Again, a fish pole is not required for all wiring projects.  For a DIYer, keep in mind this tool is available if you get into a situation where it is needed.



**Measuring devices**

Laser measuring tools are becoming more popular, but no electrician's tool belt is without a basic tape for simple measurements. Those with rare earth magnetic tips that stick to iron and steel surfaces permit fast, one-person measurements. Most folks already have a tape measure but if not you can pick one up at any hardware store or online.



**Labeling machines**

Properly labeling work at installation saves time when making the final connections.  Labeling wires including electrical, Ethernet, and coax as you install the wire makes the final panel connections much quicker.  A labeling machine can be used to label these wires.  It can also be used to create labels for your electrical panel which is very handy.



Assignment

1. Mention 5 tools for house wiring
2. What is conduit wiring

Week 11; revision

Week 12; examination