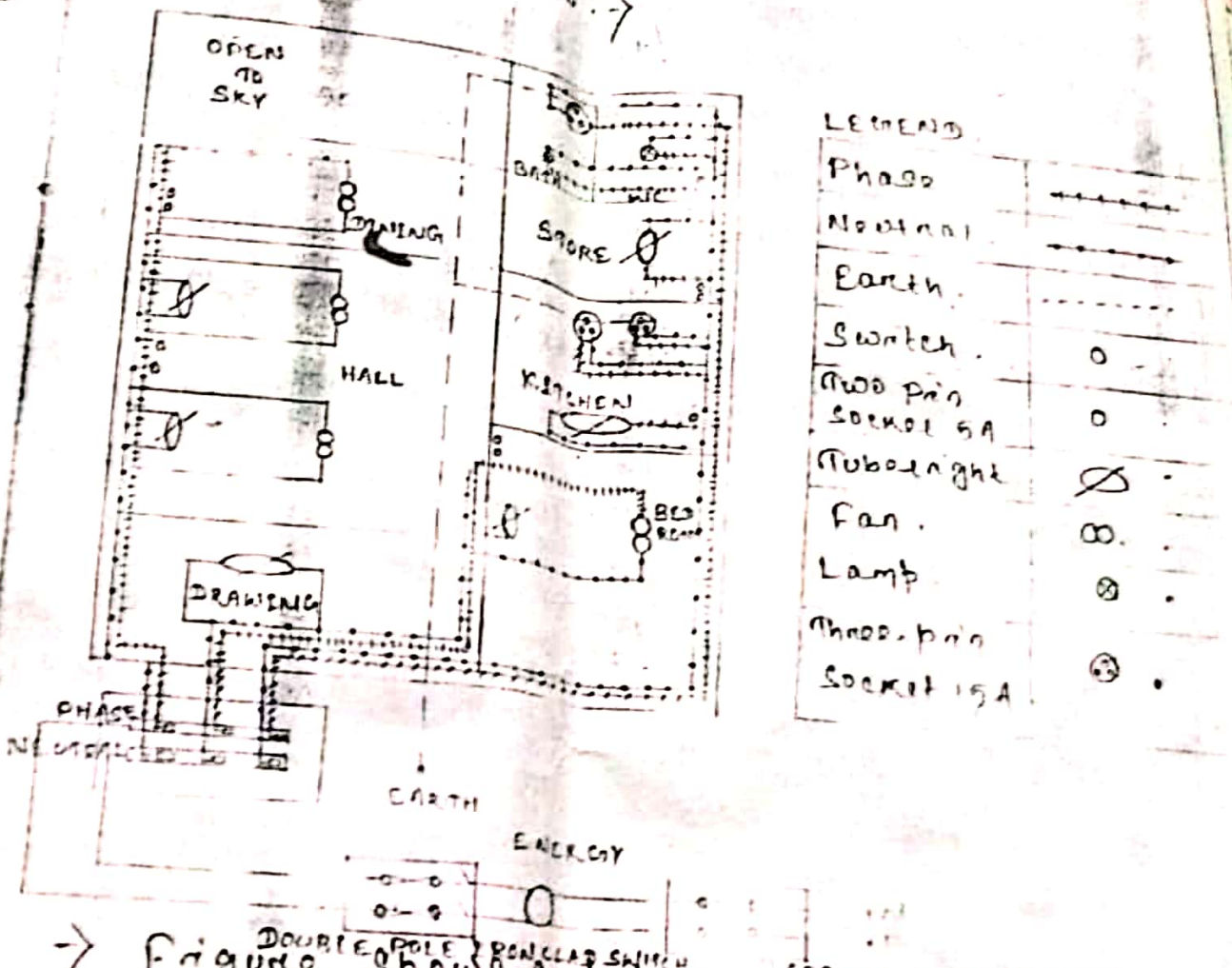
Layout of wiring :-



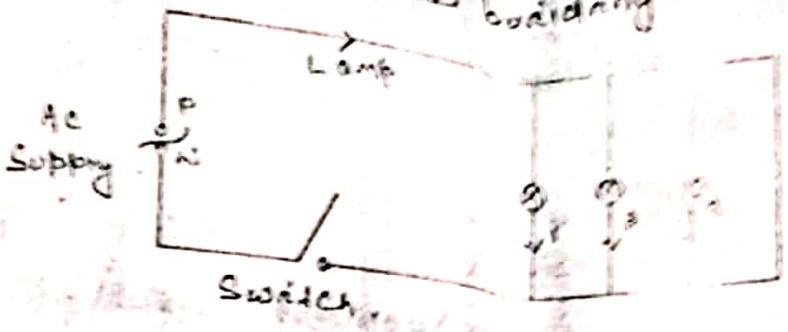
→ Figure shows a typical layout of wiring in a residential flat.

→ The supply wires such as phase and neutral are made to feed into the energy meter after connecting it through supply authorities cut-out fuse.

→ Then the wires are connected to iron clad switch called main switch before connecting it to the distribution fuse board.

→ In the distribution board, the phase and neutral are branched out into required number of terminals.

parallel connection is that in case of one device fails it will not affect the working of other devices. Thus this method is usually adopted for wiring residential building.



Classification of wiring System

The following types of wiring system are generally used in domestic electrical installation.

(1) Cleat wiring System.
(2) Wooden-casing, capping wiring System.
(3) PVC or CTS or TRS wiring System
(4) Lead sheated wiring system.
(5) Conduit wiring System.

(1) Cleat wiring System

This is the most economical wiring System when compare to the other types. Initially wooden brags are driven in the wall at an interval varying 0.3 to 0.6 m.

→ cleats made of porcelain with a base and a cap are used to hold the wire.

→ This assembly (base, cap and wire) is screwed into the plug of the wall.

(4) Lead sheated wiring system

In this system lead sheated wires are used which are firmly clamp board and have it can be supported to main wiring.

→ Normally it is used for out door wiring.

(5) Conduit wiring system :-

It is classified into 2 types.

(a) Surface conduit wiring system

(b) Concealed conduit wiring system.

(a) Surface Conduit wiring system

It is a simple type of wiring as the conduit gives protection against mechanical damage, fire or dampness, thus increasing work life.

→ It is the most preferable system for factories and important buildings. The conduits are either made of galvanised iron (GI) or polyvinyl chloride (PVC).

(b) Concealed conduit wiring system

This system is very much similar to the previous system except that the conduit is kept on side the ceiling and the wires during the construction of the building before plastering.

→ once the plastering is done, the conduit will not be visible outside.

→ Though it is very costly now a days it is used in all types of buildings for good appearance

→ The phase and the neutral leading from each respective terminals are called as sub-circuit and each sub-circuit can be independent of other sub circuit.

→ It is found that each equipment in each room is connected by a phase and a neutral.

→ The terminals that have to be earthed are given earth connection.

Wiring system / Methodology

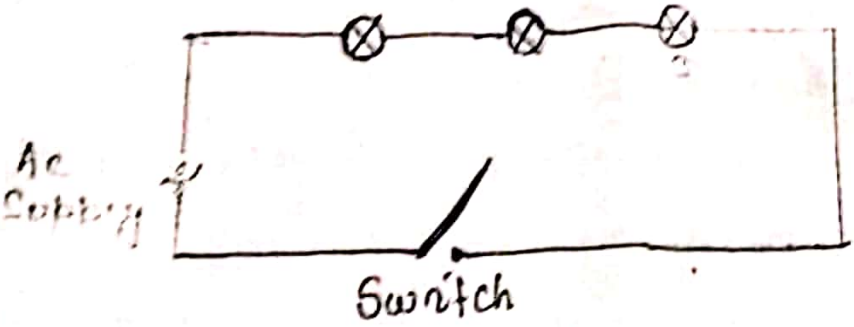
(1) Series circuit connection.

(2) Parallel circuit connection.

(1) Series circuit connection

In this type of connection all the electrical devices are connected one after the other continously as shown in fig.

→ The main advantages of this type is that even when one device fails the entire circuit will not work



(2) Parallel circuit connection.

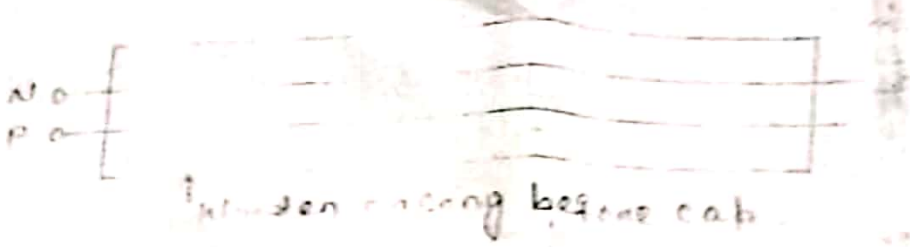
In this method, the electrical devices are connected side by side drawing power from the sources respectively. fig. shows a parallel circuit. The greatest advantage of

(2) Wooden casing capping wiring system

This type of wiring system is widely used for domestic purpose even though it is little costlier.

→ As the name indicates the case and the cabs are made of wood and is screwed to the wooden. brugs drawn at the regular intervation the wall.

→ PVC cables are predominantly used and it is housed inside the casing.



Wooden casing batten cab

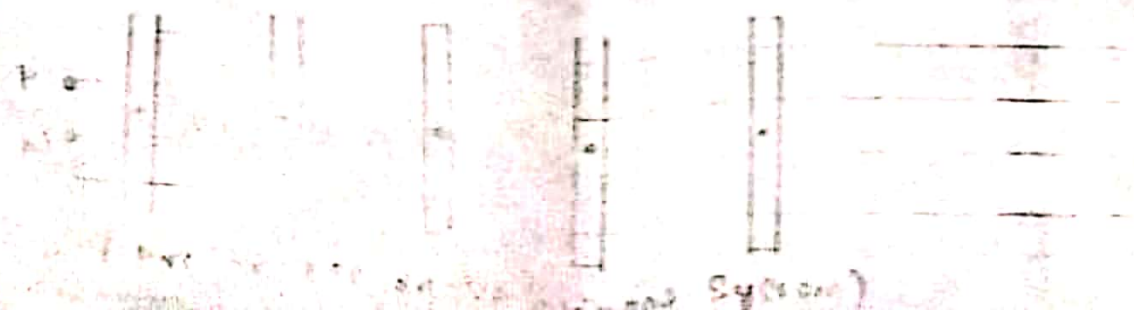
(3) PVC or CTC or TRS wiring system.

This is one of the oldest type of wiring system and is also caused as batten wiring system.

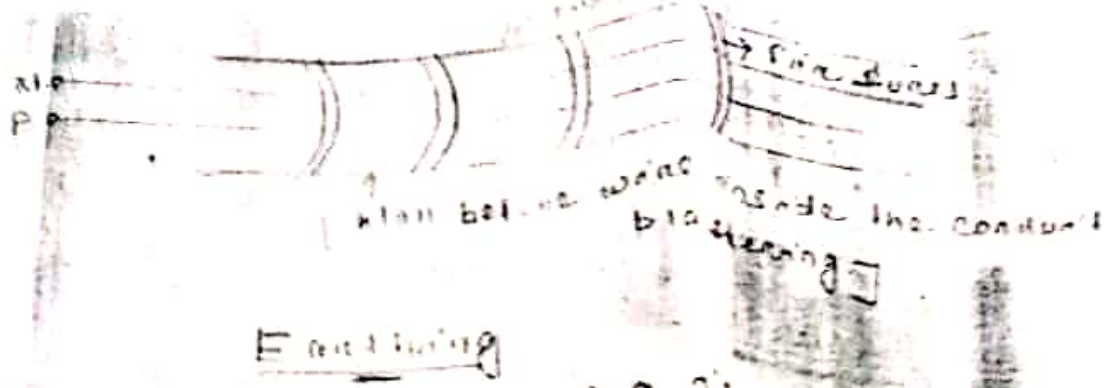
→ Teak wood battens are used in this system with cleats fixed at intervals varying from 6 cm to 15 cm.

→ PVC or CTS or TRS wires are used in this system.

→ The cable, batten and the cleat assembly is mounted on the wall as shown in fig.



PVC (CTS or TRS) wiring system



Earthing

Earthing is nothing but connecting the electrical appliances or devices to the ground so that any unwanted current such as leakages, faults etc. is immediately discharged to the earth.

→ The purpose of earthing is to avoid electric shock to the human body.

→ According to Indian electricity rule no. 61 the following parts of the electrical equipment are to be connected to the earth.

They are

(i) Metal frame of generators, motors and all metallic parts of the equipments.

(ii) Earth terminal of three pin lighting and power plug socket.

(iii) All metallic casing parts of portable equipments like heater, electric iron box, refrigerator, hair drier etc.

(1) Plate earthing

This type of earthing is usually adopted in a rocky location.

→ A copper wire of enough length is drawn into horizontal trench.

(2) Rod earthing

This type is very much suitable for sandy soil.

→ A galvanised iron rod of diameter 1.9cm is laid vertically to a depth of 200 to 300cm.

→ The conductor is fixed to the rod with clamps

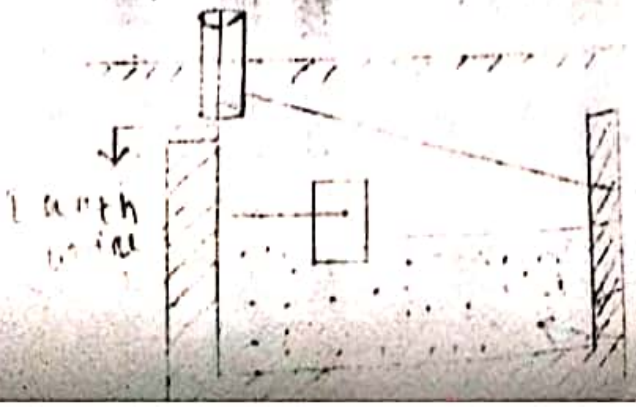
(3) Pipe earthing

A GI pipe is used as an earth electrode in this method.

→ For ordinary soil, the pipe used as 2m long and 38mm in diameter.

→ The pipe should be completely covered by 80mm of charcoal with a layer of common salt 30mm all around it.

→ Charcoal and salts are used to decrease the resistance offered by the earth mass to the current that is comming towards it.



(4) Plate earthing

In this method, a G.I plate or a copper plate of square shape is used as an electrode.

→ If a G.I plate is used then a size of 0.3m x 0.3m and with 6.35 mm thick plate is used.

→ If a copper plate is used then size of (0.3m x 0.3m) and with 3.2mm thick plate is used.

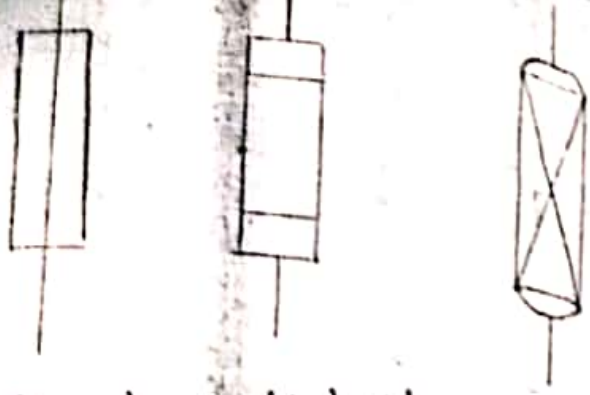
→ The plate is completely covered by 20mm of charcoal with a layer of common salt of 30mm all around it.

→ Keeping the face of the plate vertical as shown in figure.

Fuse

Fuse is provided at many places in electrical installations especially along with main switch and at distribution fuse board.

→ Fuse is represented by any of the following forms.

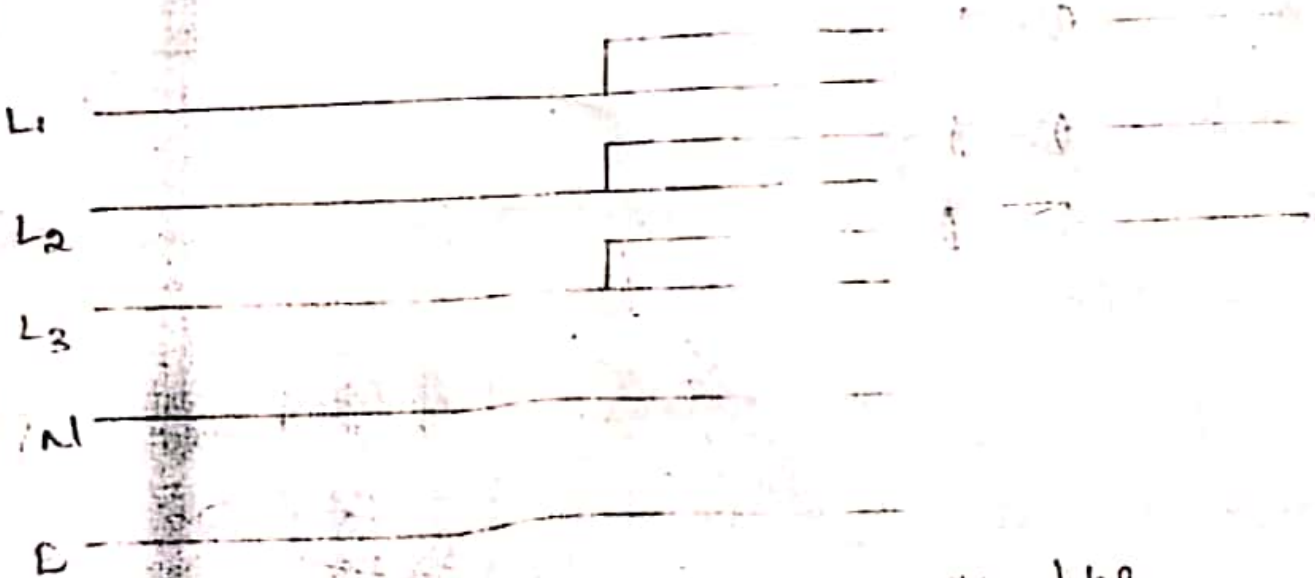


→ It is a thin piece of wire with low melting point fixed at its ends in a fuse plug.

→ The function of a fuse is to protect the electrical devices from heavy current.

→ Thus whenever a high voltage passed through a fuse wire it automatically melts and breaks the circuit.

→ fuse is always provided in the live wire and not on the nutral and earth as shown in figure.



[Three phase connecting with the Service lines].

Elevators or Lifts

The elevators or lifts are generally provided for multistoreyed buildings.

→ Multistoreyed buildings are those which have more than four storeys including the ground floor.

→ The buildings having two storeys are called ordinary building.

→ The buildings having more than two storey but less than five storeys are called special building.

→ Lifts are the only mode of transport which are moving purely vertical. both passengers as well as freight can be transported to the required storey using lifts.

→ The power required to drive the lifts can be obtained by electrically or hydraulic means.

→ Usually hydraulic elevators are used upto five storeys.

Escalators

Escalators are other wise known as power stairs.

→ In modern commercial buildings such as shopping malls, retail outlets and showrooms etc., escalators have become the essential component.

→ It is very useful to carry more number of people between one floor to the other at any instant.

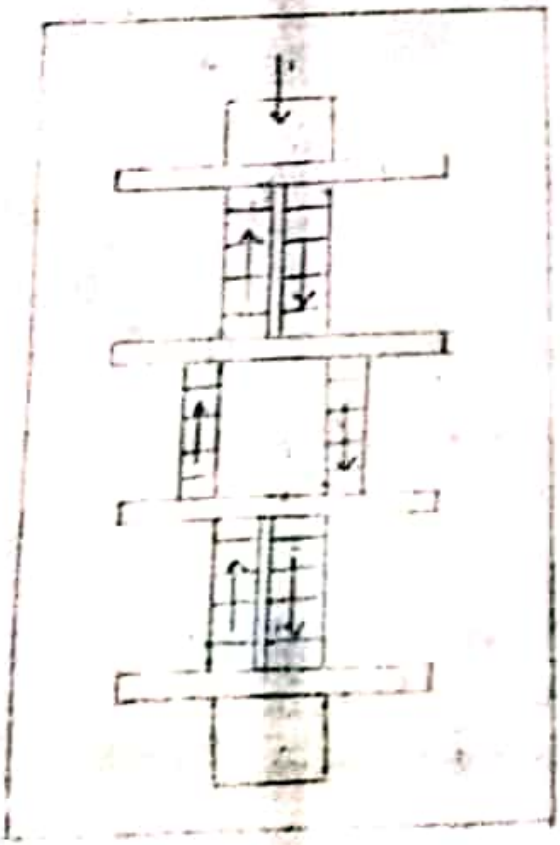
→ When compare to the lift, it is less time consuming and have more capacity.

→ The components of an escalator consists of a steel trussed frame work, hand rails, and endless belts with steps.

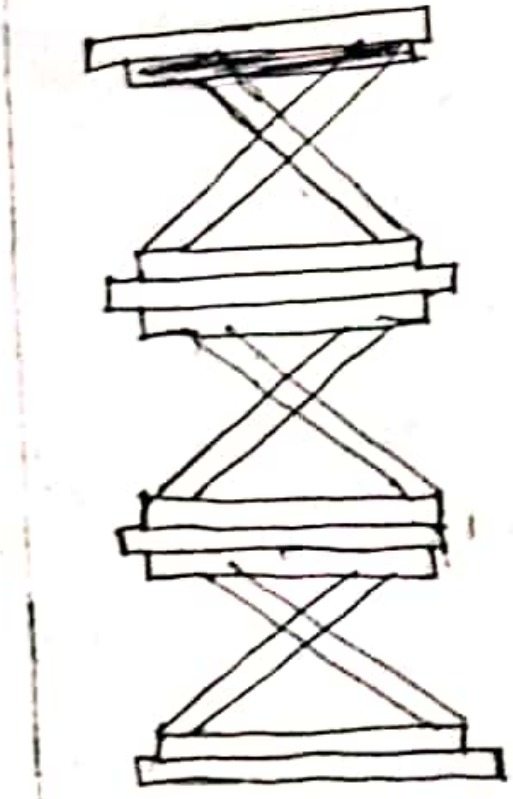
→ At upper end, there is a train of motor driven sprocket wheels and worm gear driving machine.

→ Escalators are operated at a speed of 30.40m per minute.

→ The arrangement of escalators in each storey can be either parallel to cross cross connection.



Parallel arrangement of escalators



[Criss-cross].

Lighting.

This phenomenon deals with the measurement of visible light as perceived by human eyes.

→ The human eye can only see light in the visible spectrum and has different sensitivities to light of different wave lengths with in the spectrum.

Requirement of lighting.

Lighting is required to provide a comfortable reading and working environment.

→ In-adequate light intensity causes discomfort and unnecessary strain, resulting in reduced work efficiency and deterioration in health.

$$\text{Efficiency} = \frac{\text{output}}{\text{input}} \times 100$$

Measurement of light intensity.

A device called photovoltaic cell, similar to the light meter used by photographers is frequently employed in light intensity measurements.

→ When the cell is illuminated, electron cross the rectifier junction and produce an electromagnetic force (emf) which in turn causes current to flow if the external circuit is closed.

→ A tungsten metal ... which ... on the cell.

→ The response of photovoltaic cell is different with different colour light sources and does not correspond very closely to the spectral response of the human eye.

→ However light fullness can connect this.

Ventilation.

Ventilation may be defined as supply of fresh outside air into enclosed space or the removal of deside air from the enclosed space.

In other words ventilation is the removal of all ventilated air from a building and its replacement with fresh air.

functional requirements of a ventilation system

From the view point of comfortable living and working condition, a ventilation system should meet the following functional requirements

(1) Rate of supply of fresh air.
(2) Air movements or air changes
(3) Temperature of air
(4) Humidity
(5) Purity of air.

Systems of ventilation.

The systems of ventilation are basically divided into two categories.

(1) Natural ventilation or aeration.

(2) Mechanical ventilation or Artificial ventilation.

(1) Natural ventilation.

In this systems of ventilation, the outside air is supplied into a building through windows, doors, ventilators or other openings due to wind outside and convection effects arising from temperature or vapour pressure differences on both between the inside and outside of the building.

→ Natural ventilation is usually considered suitable for houses and flats (that is small buildings) and it cannot be adopted for big offices assembly halls, theatres, auditoriums, large factory workshops etc.

→ An opening area equal to not less than $\frac{1}{20}$ th of the floor area of the room should be provided in view of proper ventilation.

→ The top of this opening area should not be more than 45cm below the ceiling.

→ The rate of ventilation by natural means is through doors and windows and other openings depends upon the following efforts.

(ii) Wind effect (Wind action)
(iii) Stack effect (Due change in temperature)

Determination of rate of ventilation

The rate of natural ventilation varies from time to time depending upon the wind action and stack action through out the year.

(a) Rate of ventilation due to wind action

In this, the wind may be assumed to come from any direction with in 45° of the reaction of prevailing wind.

$$Q = K A v. \quad \text{---} (1)$$

Where, Q = Rate of air flow in m^3/hour.

K = Co-efficient of effectiveness

This depends upon the direction of wind relative to the opening and on the ratio between the areas of two openings.

K = 0.6, for wind perpendicular to openings.

K = 0.3, for angle less than 45° to the openings.

A = Area of inlet openings in m^2.

v = Wind speed in m/hour.

(b) Rate of ventilation due to stack effect.

$$Q = 640 \times Ce \times A \sqrt{h(ti - to)} \quad \text{---} (2)$$

Where, Q = Rate of air flow in m^3/hour

A = free area of inlet openings in m^2.

Ce = co. effect. (Co-efficient of effectiveness the value of which ranges from 0.45 to 0.5

h = vertical height distance between inlet and outlet air motion

t_i = Average temperature of indoor air at height h in °C.

t_o = Temperature of outdoor air °C.

(C) Mechanical or An...

(C) Rate of ventilation due to combined effect :->

The rate of air flow by combined wind action and stack effect may be evaluated as follows.

(i) Calculate the rate of air flow by formula (1) and (2) by wind action and stack effect respectively.

(ii) Express of the air flow, given by the formula (2) as a percentage of the total air flow.

(iii) Usually in ... buildings, the ventilation due to stack effect is significant and hence neglected.

(2) Mechanical or Artificial ventilation.

In this system of ventilation, the outside air is supplied into a building either by positive ventilation or by infiltration by reduction of pressure inside due to exhaust of air or by combination of both.

Scanned with CamScanner

This system is adopted for big offices, banks, assembly halls, auditoriums, theatres, etc.

The following methods of mechanical or artificial ventilation are in common use

i) exhaust system
ii) supply system
iii) combination of exhaust or balanced system.
iv) Air conditioning system

Necessity of ventilation:-

→ To pervent an undue concentration of body orders fumes, dust and other industrial products.

→ To prevent an undue concentration of bacteria carrying particles.

→ To remove products of combustion and in some cases to remove body heat and the heat liberate by electrical and mechanical equipments.

→ To create air movement so as to remove the vitiated air or its replacement by the fresh air.

→ To create healthy living condition and wor condition.

Soil Reinforcing Techniques

Soil reinforcement is defined as a technique used to improve the engineering characteristics of soil. The soil strength is improving to enable it support or carry more load.

Neccesity of Soil reinforcing →

Soil reinforcement is necessary in lands where chances of erosion are high. It is particularly useful in areas with soft soil as it can not provide adequate support to any construction.

Use wire mesh & geo-synthetics

It is a facing system using steel wire mesh to align and shape the slope of the reinforcement structure. Vegetation and fire-retardant are compatible with this type of facing system. Slope at earthquake zone or at narrow & fractured zone etc. Wall surface can be vegetated for natural appearance finish.

Strengthing of embankments →

Road & railway embankments are usually large and high earth structures which require considerable quantities of fill soil & land. The cost of the fill soil & its transport from the quarries as well as the value of the land, may be so high that some alternatives may be considered such as designing steeper slopes or using lower quality fill soil. Geogrids allow the slope to be built at any inclination with the required factor of safety. Almost any locally available soil can be used for the geogrid reinforced embankment this facility can produce very large savings in both cost and construction time.