Dt. 14.01.2020

Civil Engineering:

Civil engineering is considered as first discipline of the various branches of enginnering and it includes designing, planning construction and maintenance of infrastructure.
This work includes roads, bridges, buildings, dams, canals, water supply and numerous other facilities that affect the human beings.

Sub discipline of Civil Engineering:

Civil Engineering is a multiple science incompassing, numerous subdescipline that are closely link with each other the various subdescipline of civil engineering are mentioned below.

Structural Engineering

This descipline involves the design of structure that should be said for the users. The design and analysis should initially identify the loads that are created due to loads and then design the structure to with stands the loads. it includes ~~load~~ steel structure and concrete structure.

Geo-Technical Engineering:

Geo technical engineering deals with soil rocks foundation of building and bridges, highways, sewers and under ground water system.

Water Resource Engineering:

This discipline of civil engineering concern the management of quantity and quality of water in the underground and above ground water resources such as lake, river and streams.

Environmentally Engineering:

It is related to the science of based management and all types of purification of water, cleaning of contaminated areas, industrial ecology.

Some other discipline included in civil engineering such as:

Earthquake transportation and surveying engineering.

17/01/2020

Scope of civil Engineering:

when planning to find a carrier in convential and promising branch of engineering, Civil engineering is one of the most important, after options amount students in India.

1. GIS (Geographycal Information system)
2. structural and foundation analysis
3. CPM (critical path method)
4. Tall building design.
5. construction technology
6. foundation design
7. Construction project management
8. Building information modeling
9. Seismic design.
10. Quantity serveying.

Importance of civil Engineering:

1. Civil engineering design, construct, supervise operate and maintain large construction project and system including roads, buildings, airports, tunnels, dams, bridges and systems for water supply and sewage.

2. Many civil engineers work in design construction research and education.

3. Construction spending is projected to exceed 1.07 trillions us dollars in 2016 and updated market analysis from the US Bureau of level statics employeement in civil engineering is projected to see of about 25% through 2018 faster than the average for all occupation

4. More over a growing population means that new water systems will be required while the existing more waste treatment plan will be needed to held clean nations water way.

5. Civil engineers play a key part in all of this works.

Yearly construction and development over time:

History of construction:

People have constructed buildings and others structure including bridges, dams, roads and canals.

Building materials in present use have long history and some of the built thousand of years ago are remarkable.

Development of construction: 18/01/2020

1. Chronological development:

a. Neolithic construction:

Neolithic also know as old stone age which time period droping from 9000 BC to 5000 BC, Name because it was the last period of age before wood working.

The tools available where made from natural material including both bone, stone, grasses, animal fibre & use of water.

This tools were used by people to cut such as with the hand axe chopper etc.

for example:- The first bridges made by humans were probably just wooden log place across as are with and later timber causeway

b. Copper age and Bronze age construction:

→ The copper age is the early part of bronze age. Bronze age made when tin is added to copper and Brass is copper with zinc.

→ Copper come into use before 5000 BC & Bronze around 3100 BC although the times very by egion.

Copper and bronze were useful for the same types of as such as; axes & chisses, but the new more durable material cut better

Bronze was cast into designed shape and it damage

A new tool develop in the copper age is saw.

Iron age construction:

- Iron age is period from roughly 1200 B.C to 1500 B.C with the wider spread of use for iron for tools and weapons.
- Iron is not much harder than bronze but, by adding carbon iron, becomes steel which was being produced after about

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Manufacturing of bricks:

1. Preparation of clay:

- soil beneath 200mm from top surface is made free from Gravel, coarse sand, vegetable matter etc. And kept so as to expose to the weathering.
- suitable ingredients are added to it and through mixing is done using sufficient quantity of water.
- The whole mass is ~~needed~~ kneaded with spade or, manual and mechanical equipment into a plastic mass

(25)

2. Moulding:

- The prepared soil mass is moulded in the standard mould made of steel or wood. the moulds are generally 8-15% larger than required size of brick to allow for drying.
- Moulding may be done either by hand or using machine.
- Hand moulding may be ground moulded or table moulded
- Large scale manufacture of brick can be achieve by machine moulding

3. Drying:

- The raw bricks obtained after moulding are then allow to dry for 7-14 days, In order to prevent bursting of bricks during burning process.
- Bricks in stacks are arranged in such a way that sufficient air space is left between them for free circulation of air
- when bricks are to be dried rapidly on a large scale artificial drying may be addopted

4. Burning:

- The dried bricks are burnt either in clamp or in kiln.
- Clamps are temperary structure to manufacture bricks on small scale.
- kiln are permanet structure to manufacture brick on large scale
- Burning of bricks import hardness and strength to the brick and makes them dense and durable.
- If bricks are over burnt they will ~~sint~~ shrink

on the otherhand if they are under burnt they will be soft and hence cannot carry loads.

Classification of Bricks:

1. First class
2. second class
3. Third class
4. fourth class

Clay bricks are classified as shown upper. based on their physical and mechanical properties:

first class brick:

- These are throughly burn and are of deep red cherry or copper colour.
- The surface should be smooth rectangular with paraael, sharp and straight edges and square coreners,
- → These should be free from cracks.
- → These should have uniform texture.
- → No impression should be left on the brick when scartch is made by finger nail.
- → The fracture surface of bricks should not show longs of like

A metallic or ringing sound should come when the bricks are stock against each other.

→ water absorbtion should be 12-15% of its dry weight when emerged in cold water for 24 hr.

Second class brick:

They are exposed have the same requirement as though first class bricks except that

→ Small cracks are permitted
→ A little higher water observation of about 16-20% of its dry weight is allowed
→ The crushing strength should not be less than 7 N/mm2

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Third class brick:

- These bricks are under burnt
- They are soft, and light coloured producing a dull sound when struck against each other.
- water absorbtion is about 25% of dry weight

uses
It is used for building temperary structure.

Fourth class brick:

→ They are over burnt, and badly distorted in shape, size and Brittle in nature

uses ballast
The ~~balanced~~ of such bricks is used for foundation and floors of lime in concreet and road.

Qualities of good bricks:

1. Bricks should be well burnt, copper colored, free from cracks and with sharp and ~~uniform~~ ~~s~~ squar edge.
2. Bricks should be uniform in shape and be of standard size.
3. Bricks should be sufficiently hard
4. when ~~so~~ soaked in water for 24 hour The absorbtion of water should not be greater than 20% of dry weight.

6. The bricks should not break when droped from a height of 1m.

7. Bricks should be sound proof and fire resistant.

8. Crossing ~~straigth~~ strength of good bricks should not be less than 5.5 N/mm2

9. Bricks should give clear ringing sound when stock with each other.

10. Bricks should have low thermal conductivity.

Uses of bricks:

* Bricks are used for construction of walls, colocum etc.
* Bricks are used for construction of bridge, dam etc.
* Bricks are used flooring and paving.
* Bricks are used in construction of water tanks, chimney, light houses etc
* Fire bricks are used if interior of furance and flees

* Brocken bricks are used for construction of aggregade of concret.
* Bricks of high quality are used for facing of ~~walls~~ works.
* Perforated bricks are used for insulation purposes

Stone

Stones have been considered as one of the older building material from the older days due to their availability from the natural rocks. Building stone should posesses enough strength and durability.

* Stones are used for construction of dam, barrage, roads, abuitment, retaining walls.

Classification

* Building stones are obtained from rocks. Rocks can be classified in three ways:
    1. Geological classification
    2. Physical classification
    3. Chemical classification

Geological classification:

According to this classification rocks are of following three types.

a) Igneous rock
b) sedimentary rock
c) Metamorphic rock

Igneous Rocks:

These rocks are formed as a result of consolidation or solidification of molten material known as molten magma either in the interior of earth ~~crossed~~ crushed and upon in the surface. They represent a crystalline or fused texture.

* Igneous rocks are hard durable, strong, top.
ex. granite, ~~bole~~ dolerite, basalt.

Sedimentary Rock:

These rocks are formed by deposition of product by weathering like wind, frost, glaciour etc.

* Due to this formation, they are generally statified by the difference in texture, colour, and composition.
* They are mainly close grain, open texture and crystalline structure.

Ex: Gravel, sand stone, limestone.

Metamorfic Rocks:

→ These rocks are either igneous or sedimentary in their origin but subsequently changed due to movement of crushed as a result of Metamorfic action of heat and pressure.

→ The rocks don't have uniform layer of statification.

Ex: Slate, quaterzite, marble.

Stone Quarrying:

The process of taking out stone from natural rock beds is known as quarrying. The term quarry is used to indicate the exposed surface of natural rocks. Different methods of quarrying are

* Quarrying with hand tool
* Quarrying with chanelling machine
* Quarrying with blasting

Dracing of stones:

Stone after being carried are to be cut into suitable size for construction work the process is known as dracing of stone.

Dracing provided a pleasing appearance anables to obtain arnamental shape, minimize mortal joints. axe, hammer, chisen are used to get stone smooth

Uses of stone:

Stones are used for following purposes

1. foundation, walls, colourmns, arches, floors etc.
2. for carving walls
3. Construction of light houses.

4. for the construction of road wedge.
5. as agregate in concret.
6. As balanced for railways.
7. As flux in blast furance.
8. As flux in construction of bridges, retaining wall and dam.

Cement

cement is an inorganic non-metalic product that may be mixed with water to form paste, the paste which is temporarily plastic and may be molded, may or may not have agregade added to it.

Ingredient	percentage
lime (CaO)	62
silica (SiO_2)	22
alumina (Al_2O_3)	5
calcium sulphate ($CaSO_4$)	
Ironoxide (Fe_2O_3)	3
magnesia (MgO)	
sulphur (S)	2
alkalies	1

~~Cement is made by~~

Properties of ordinary portland cement:

Chemical property:

Portland cement consist of the following chemical compounds:

a) Tricalcium silicate - $3CaO.SiO_2$ (C_3S), 40%
b) Dicalcium silicate - $2CaO.SiO_2$ (C_2S), 30%
c) Tricalcium aluminate - $3CaO.Al_2O_3$ (C_3A), 11%

Physical property:

The following physical properties should be checked before selecting portland cement for the civil engineering.

* Fineness
* setting time
* soundness
* crossing strength.

Fineness:

It is measured in terms of percentage of weight retained after seiving through 90 micronship sieve. According to IS specification weight retain on the sieve should not be more than 10% in terms of specific surface should not be less than 2250 cm^2/gm

Setting time:

A period of 30 min. as minimum setting time for initial setting and a maximum period of 600 minute as maximum setting time.

Soundness:

Once the concret has harden it is necessary to ensure that no volumentric change takes place. The cement is said to be unsound if is exhibit volumentric instability after hardening.

IS code recomand test with Lechatelier mould of testing this properties

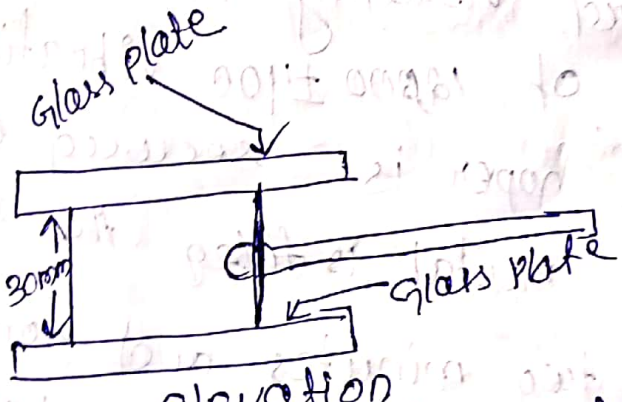
Crossing strength:

for this mortal cubes are made with standard sand and tested in compression testing machine as per the specification of IS code. The minimum strength spreibed is 60 N/m2 after 3days and 22 N/m2 after 7 days of quirring.

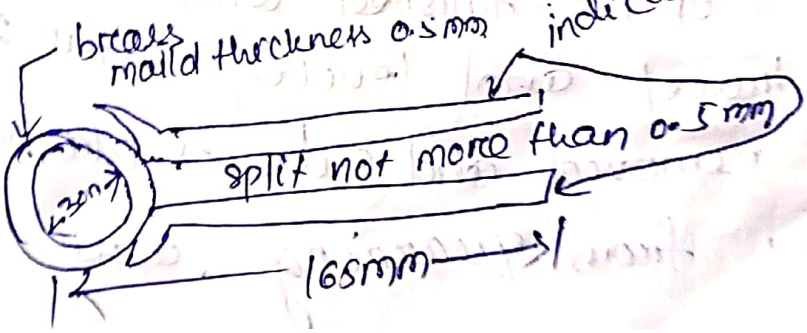
annular ring
time is noated as final setting time.

Soundness Test:
This test is conducted to find free time in cement which is not disarable
Le chatelier apparatus is shown in the figure
it is used for conducting this test it consist of spilt brass mould of diameter 30mm and height 30 mm on either side of the split there are two indicators with pointed ends. The ends of indicator

are 165mm from the centre of the mould properly oiled. Lechatelier mould is placed on a glass plate and is filled completely with a cement paste having point 78 times the water required for standard consistency it is then covered with analog glass plate and a small plate is placed over it then the whole assembly is kept under water for 24 hour the temperature of water should be between 24°c and 50°c, note the distance between the indicator, then placed the mould again in water and heat the asemby for one-hour, now the mould is removed from water and allowed to cool. distance of two points is measured. the difference between the two readings indicate expansion of cement dee to present of unsound line. this values should no exist 10 mm.



elevation



Crossing strength Test:

For this 200gm of this cement is mixed with 600gm of standard sand conforming to IS 650-1966, after mixing throughly in dry condition for a minute distilled portable water P/4 ±3% is added where P is the water required for standard consistency they are mixed with trowel for three to 4 minutes to get uniform mixture the mix is placed in cube mold of 70.64 mm to get uniform mixture and is kept on steel plate with 25mm standard steel rod 20 times withing 8 sec. then the mold is placed on a standard vibrating table that vibrates at a speed of 12,000 ±400 vibration per minute a hoper is secured at the top and remaining mortal is filled the mould is vibrated for two minutes and hopper removed the top is finished with knife or with a trowel and leveled after 25 ± 1 hour mould is removed and cube is placed under clean water from quarrying. ~~after~~

After specified period cubes are tested in compression testing machine keeping the specimen on its average of three cubes is reported as crossing Strength the compressive should/it be less than 11.5 N/mm² and at the end of 7 days not less than 17.5 N/mm²

Types of cement:

Some of the common type of cement used as as follows

* quick setting cement:

In this type of cement the setting action starts within five minutes after the addition of water and saids finally in about 30min. this cement is used to lay concret under coat er

* Rapid hardening Cement:

It is also known as high early strength Cement it saids and harden in a much Shuttere time than the ordinary cement and develops highere strength in the early stage the advantages of this cement over the ordinary cement are that the foremaster

~~work~~ can be removed earlyer and the structure can be loaded earlier this cement is useful for repaire ~~work~~ work.

*Low heat cement:

In this type of cement the rise in temp or setting is less than that of the ordinary cement this cement is used for works where it is necessary to restrict heat generation during concreting in large masses of concrete such as dams bridges etc.

*White cement

It is made up chuck or pure limestone or chinaclay, it's whiteness is due to absence of ironoxide which impacts coloured to the ordinary cement it is about 4-6 time more costly than ordinary cement it is used for floor finish plasterworks,

colour cement

It is made by adding suitable mineral pigment cromium oxide, manganese oxide, to the ordinary cement. It is used for finishing floor, external surface, window, stare.

*Expanding cement:

This type of cement is made by adding an expand medium like sulfo aluminate to ordinary cement it is used fore the construction of water retaining structure and also for repairing the damage concrete surface.

*Pozzolana Cement:

Pozzolona is a type of volcanic ash found in italy. It can be processed from shales and certain types of clay. In this pozzolona material is 10-30% it can resist action of sulphate it releases less heat during setting it impacts higher degree of water tyseness its tension strength is high but compressive strength is low it is used for mass concret work it is also used in sewage line works.

High allumina Cement:

It is manufactured by calcening a mixture of line and baqusite it is more resistance to sulphate and acid attack it developes full strength within 24 hrs of adding water it is used for under water work.

Blast flurance Cement:

In the manufacture of pigiron, slag comes out as a waste product by grinding clenker of cement with about 60-65% of slag cement is produced it is chief and in utalizes waste product, the cement is durable but it gains strength slowly, hence needs long Period for quarring.

Acid resistance Cement:

The cement is produced by adding acid resistante agregate such as quartz, ~~go~~ ~~water~~ quartzite, sodium silicate or soluable ~~gas~~ glass, this

cement has good resistance to the action of acid and water it is commonly used in the construction of chemical factories

Sulphate Resistance Cement:

By kepping the percentage of tricalcium aluminate (C_3A) below 5% in ordinary cement this cement is produced it is used for the structured which are likely tobe damaged by alkaline condition.

Example of structures are tenal, curverts.

Concrete:

Concrete is the mixture of cement or lime or sand or crust stone and water indefinite proportion. Cement or lime acts as binding agents, sand forms the fine aggregate, Gravel or crust stone are forms as Sourse aggregate

The concrete prepared using cement is known as Cement Concrete.

Constituent of concrete:

The main constituent of concrete are cement or lime, before introduction of ordinary Portland cement (OPC) lime as used as cementric material at present most of the cement concrete works in the building construction is done with OPC

fine aggregate:

The material which is passed through 4.7625 mm sieve is turned as fine aggregate. usually natural river sand is used as fine aggregate but places where natural sand is not available economically finely crust stone may be used as course aggregate. Retain on 0.075 mm Sieve

Course Aggregate:

course aggregate are the particle that retain on 4.75 mm sieve.

broken stone is usually used as coursed aggregate.

Water

water used in concrete work should have following properties.

i) It should be free from oil.
ii) It should be free from acid & alkali.
iii) portable water is good from to make in concrete.
iv) The pH value has not less than 6.

Preparation of concrete:

The process of selection of relective proportion of cement, sand, fine aggregate and water to obtain concrete work of desired quality is called proportioning at concrete.

Concrete Mined Dasgned:

Determination of proportion of concrete ingredient are cement water, fine aggregate cross aggregate which would produced concrete passing precified properties such as workability, durability, strength with mar over

Types of concrete mix:

1) Nominal mix:-

Mixed of fixed proportion 15456-2000 permits the nominal mixes of concrete strength or lower.

Designed mix:

Designed on the basis of the requirement of the concrete after a period of 28 days i.e. M20 grades refers to the strength the concrete of after 28 days is 28 N/mm2.

M refers to the concrete mix and the number 15 to 20 denotes the strength of concrete.

The concrete is known as compressive strength (MPa).

Grade concrete	Perportion of concrete	characteristic compressive strength-N/mm^2.	Types of construction:
M10	1:3:6	10	mass concreting near side of dam segment blacks etc.
M15	1:2:4	15	machine, floors, concrete roads
M20	1:1.5:3	20	General, RC. work (building) columns, slabs etc.
M25	1:1:2	25	Heavily, loads structure, RCC cubes etc.

characteristic strength of concrete:

It is defined as the value of strength below which not more than 5% of test result are ex to fail there is 95% probality of achievin this value only 5% of not achieving the strength.

WATER CEMENT RATIO:

The ratio of weight of water used to that o cement is called water cement ratio streng and quality of concrete depends upon wat cement ratio for a good quality concrete th water cement ratio should be 0.45 to 0.46.

WORKABILITY:

The term workability is used to describe e ore difficulty with which concrete can be handl transported and placed in position so that concrete remains homogenous

The workability of concrete is affected by ce cement ratio and aggregate cement ratio a slump ~~test~~ test will be find workability concrete.

Factors affecting workability:

A concrete is said to be workable. If it is easily transported placed and compacted and finished without any segregation. workability is the property of freshed mixed concrete and the concrete mix. Aggregate water and admister due to this all properties of concrete it is affected by those ingredients and proportion.

1. water content
2. Aggregate cement ratio
3. size of aggregate.
4. shape of aggregate
5. Grading of aggregate
6. Surface texture
7. Use of admister.

Quality of mixing water in concrete

Function of water in concrete

The water serves the following purpose

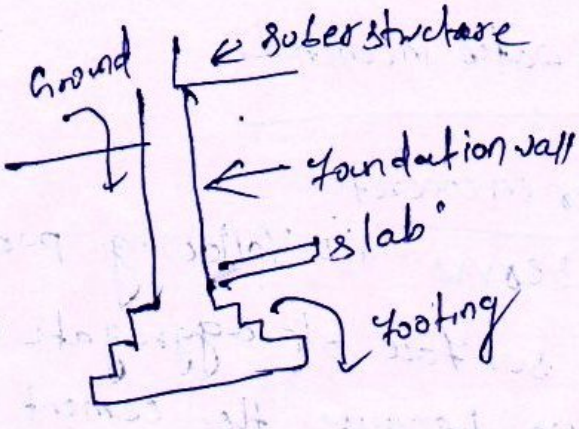
1. To wet the surface of aggregate to develop adhesion because the cement pastes adhere quickly and satisfactory to the wet surface of the aggregate than to dry surface.
2. To prepare plastic mixture of the various ingredients and to impart workability to concrete to facilitate placing in desired position
3. Water is also needed for the hydration of cementing materials to set and harden during the period of curing.

Building components and their basic requirements

The basic requirements of building should satisfy in design performance is

1. It must be strong enough to withstand the load is coming on it including the self weight, live load, wind load and earthquake loads:
2. It must not deflect and under the loads
3. It must give comfort and convinent to the inhabitants

It is divided into two parts.



1. substructre
   (1) foundation
   (1) plinth
2. superstructre

→ The portion of building bellow the ground are called substructre.

→ the portion of the berilding above the ground is called superstructre.

The components of building are

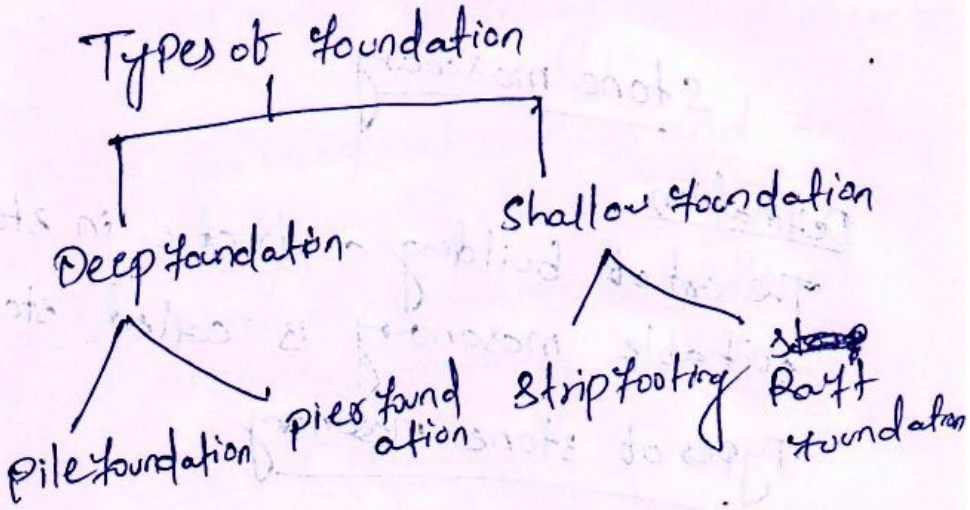
→ foundation.
→ wall
→ floor and roof
→ Doors and windows
→ stairs
→ service

Foundation

the foundation of the building transfer the weight of building to the ground.

types of foundation

(1) Deep foundation
(1) shallow foundation



Mortar

→ It of mortar is a workable paste used to bind building blocks such as stones, bricks and concrete masonary units together.

→ cement mortar becomes hard when it cures, resulting in a rigid aggregate structure.

Ingredient and properties of mortar

→ Mortar mixes include ingredients that give it strength (ie cement, sand, water) and these that promote workability and good bond with masonry units.

→ mortar bonds masonary units together.

→ The compressive strength of mortar has only a small effect on the strength of the wall but durability.

Stone masonary

Defination

The art of building a structre in stone with any suitable masonary is called stone masonary.

Types of stone masonary

1. Rubble Masonary
2. Ashlar masonary

1. Rubble masonary

The stone masonary in which either undressed or roughly dressed stone are laid in a suitable mortar is called rubble masonary.

It is further sub-divided into following types.

→ Random Rubble masonary
→ Square rubble masonary
→ Dry rubble masonary

1) → Random rubble masonary

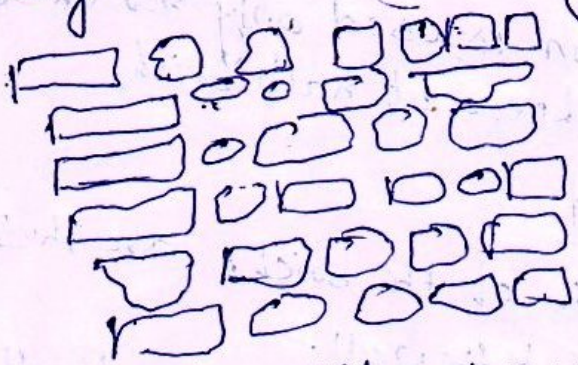
The rubble masonary in which either undressed or hammer dressed stones are used is called random rubble masonary

It is subdivided into two types

1) uncoarsed random rubble masonary :—

→ The random rubble masonary in which stones are laid without forming courses is known as uncoarsed random rubble masonary.

→ The stones used in this masonary are different shape and size.
→ large stones are used at corners and lamb to increase strength.
→ It is used for construction of walls of low height in case of ordinary buildings.



b) coursed random rubble masonry

→ The random rubble masonry in which stones are laid in layers of equal height is called coursed random rubble masonry.
→ In this masonry stones are laid in some what level courses.
→ It is used in construction of residential building, godowns boundry wall.

Brick masonry

→ This bond is weak in strength but it is economical.
→ Brick masonary is made up of brick unit's bonded together with mortar.

Bonds in brick work

a) stretcher bond
b) Header bond
c) English bond
d) Flemish bond

e) Zigzag bond

Stretcher bond

→ The length of the brick its along with face of wall.
→ This pattern is used only for those which have thickness of half brick

Header bond

→ The width of the bricks are thus along the direction of the wall.
→ This pattern is used when the thickness is about equal to one brick

English bond

→ It is the most commonly used method
→ This bond is considered to be strongest bond consist of alternate course of stretcher and header
→ alternate course will show either header or stretcher in elevation.
→ There is not vertical joint every alternate header come centrally over the joint between two stretcher.

Flemish bond

On this type of coursers comprised of alternative headers and stretchers

Types of flemish bond

→ Double flemish bond
→ flemish bond

Double Flemish bond

→ Every course consist of header and stretcher placed alternatively.

→ ~~Single~~ of the facing and backing of wall in each course have same appearance.

Single Flemish bond

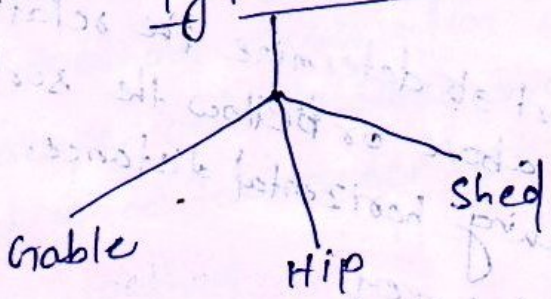
Single Flemish bond comprised of ~~double~~ double Flemish bond facing on English bond.

Roof

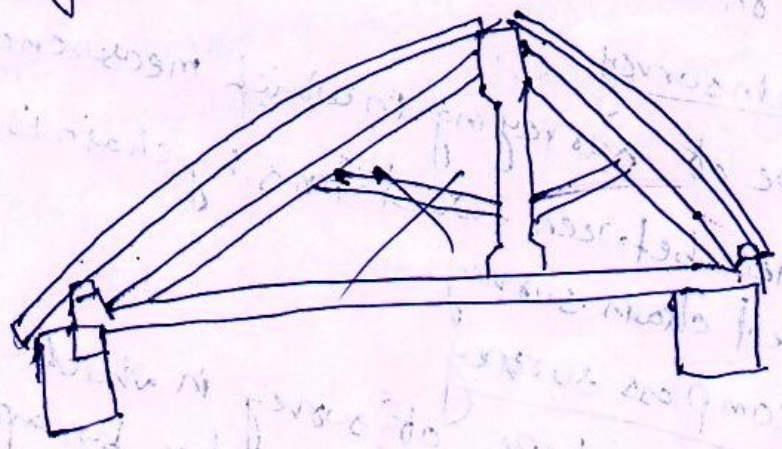
→ A roof is part of building envelope.

→ It is the covering on the uppermost part of a building or shelter which provides protection from animals and weather, rain, snow, heat winds and sunlight

Types of roof



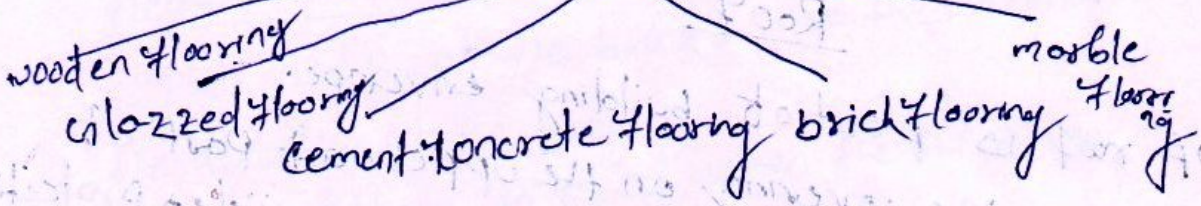
King post Truss



Floor

→ A floor is the bottom surface of a room.
→ Floors vary from simple dirt or cave to many layered surface.
→ It may be stone, wood bamboo or any other material

Types of floor



Module

Surveying

Surveying

It is the art of determine the relative positon of a point above or bellow the surface of earth by taking horizental distance.

classification of survey

Based on instruments used in surveying

1. chain survey

Type of surveying in which measurement of line between two stations by chain is called chain survey.

2. compass survey

It is the type of survey in which measurement of survy line is done by compass

Theodolite survey

It is the type of survey in which angle as well as horizontal and vertical distance of survey line can made by theodolite.

method of linear surveying

Linear surveying method can be divided into three types.

1) Direct measurement
2) measurement by compass
3) electronic methods

Direct measurement

In this surveying method, distances are actually measured on surface of earth by chain or tape.

measurement by compass

In this method observation are taken through a telescope and distances are determined by calculation as tachometer or triangulation.

electronic method

In these linear surveying methods distances are measured with instruments that rely on propagation reflection and subsequent reception of either radio or light waves.

~~CHAIN Surv.~~

chain survey

The following instruments are required for measurements with chain or tape.

(i) Arrows
(ii) pegs
(iii) Ranging rods
(iv) plumbob
(v) tape
(vi) chain.

Arrows

→ When the length of a line to be measured is more than chain length. There is need to mark the end of chain length

→ Arrows are used for this purpose.

→ Arrows are made with 4mm dia with steel wire and ~~open~~ sharpened at one end and other end bent to loop.

→ It's length is 400mm.

Pegs

→ Wooden pegs are used for measuring length of line to mark end points

→ The pegs are made of wood of 25 mm × 25 mm section and 150 mm long with one end tapered.

Ranging rods

→ For ranging intermediate points along line to be measured ranging rods are used.

→ Ranging rods are 2 to 3 m long made of hard wood or steel they are provided with iron shoe at one end.

→ They are usually circular in section with 30 mm dia and are painted with 200mm color bands of red and white or black and white

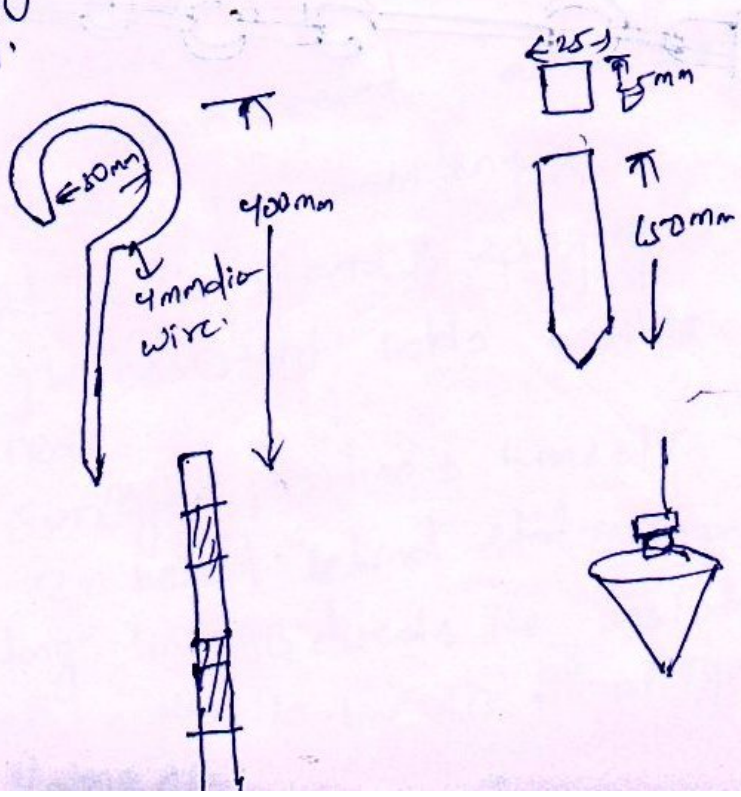
→ The length of ranging rod varies from 4 to 8 m and dia from 60 to 100mm.

plumb bob

→ A typical plumbbob is used for measuring horizental distance along sloping ground.

→ plumb bobs are used to transfer the position

→ They are used to check verticality of ranging rod.



Tapes

→ It is used for measuring lines.

It is classified as

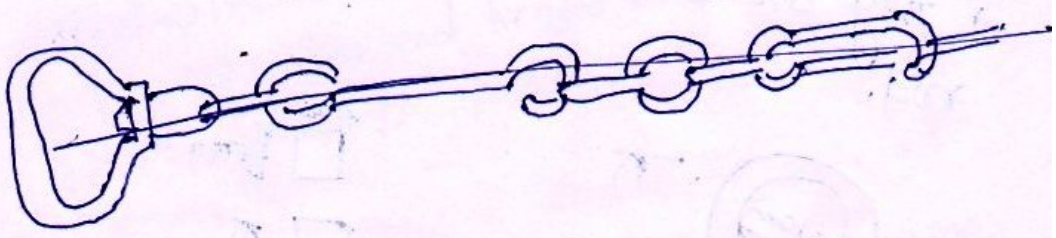
(i) cloth tape
(ii) metalic tape
(iii) steel tape
(iv) invar tape

chain

→ chains are used for measured of line.

→ It is formed of galvinsed mild steel wire bent into rings at the ends and joined by circular or oval wire rings.

→ main purpose of ring is to provide flexibility.



Ranging

When a survey line is longer than chain length, it is necessary to allign intermedate points on chain line so that the measurement are along line.

→ The process of locating intermidate points on survey line is known as ranging.

It is of two types.

(i) Direct ranging

(ii) Indirect ranging

Direct ranging

→ If 1st and last points are intervisible then this method is possible.

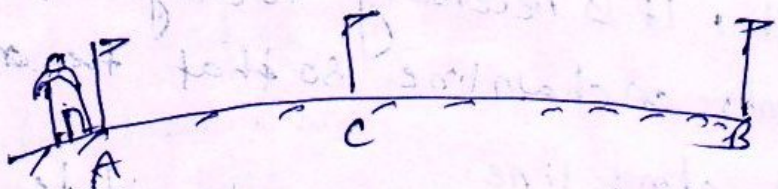
→ This figure shows intervisible stations A and B where intermidate points C is to be located.

→ Point C is selected at a distance slightly less than the chain length.

→ At points A and B ranging rods are fixed The assistant holds another ranging rod near C.

→ Surveyor position s himself approximately 2m behind station A and looking along line AB directs the assistant to move right angles to line AB till allign ranging rod along AB.

→ The surveyor instructs the assistant to mark the point and stretch along AC.



9n direct or Reciprocal ranging

→ Due to intervening ground, if the ranging rod at B is not visible from station A reciprocal ranging rod may be used.

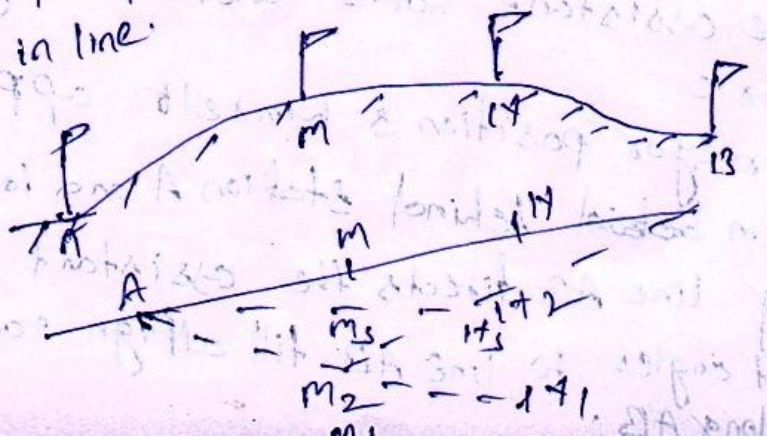
→ It needs two assistant one point at M and another point at N, where both point A and B are visible

→ It needs one surveyor at A and another at B. To start with M and N are approximately selected M_1 and N_1.

→ Then surveyor near end A ranges person near M to position M_2 such that A M_2 N_1 are in a line.

→ Then surveyor B directs person at N to move N_2 such that B N_2 M_2 are in line

→ The process is repeted till AMNB are in line.



correction to measured length

L = true length of chain or tape
L' = incorrect length of chain or tape
I' = measured length of line or actual length
I = True length of line

$$I = I'\left(\frac{L'}{L}\right)$$

correction to the Area

A' = measured area of ground
A = Actual area of ground
true area = measured area $\times \left(\frac{L'}{L}\right)^2$

correction to volume

V' = measured volume
V = Actual volume
true volume = measured volum $\times \left(\frac{L'}{L}\right)^3$

Numericals

1. The length of line measured with 20m chain. was found to be 500m. It was found to be 0.04m too long. What is the length of line.

Solution

correct length of chain, L' = 20 + 0.04
= 20.04 m

L = 20 m

measured length = 500m

True length = L'/L x measured length
= (20.04/20) * 500

Compass surveying

The components of prismatic compass

1. cylindrical metal box
   - → Diameter of 8cm to 12cm
   - → protect compass
   - → forms either casing of compass

2. Pivot
   - → centre of compass
   - → support magnetic needle

3. → lifting pin and lifting lever
   1. provided below sight vane magnetic needle
   - → it measures angle of line
   - → it is pointed towards north and south pole.
   - → it is suspended.

graduated circle
- → it is aluminium graduated ring marked to 0° to 360°.
- → it measures bearing of line

4. prism
   2) object vane
   3) eye vane

9) glass cover
10) sun glass
11) reflecting mirror
12) Brake PM

use of prismatic compass

1. The prismatic compass is a small instrument which is held in hand for observing and is there employed on rougher classes of work
2. The prism is carried on a mounting which can be moved up and down movement is to provide an adjustment for focusing
3. The oblong mirror located in front of forward vane sides up and down the vane and is hinged fold flat over it or to rest inclined at angle with it.

Introduction to Electronic distance measurement EDM

→ Electronic distance measuring instrument is surveying instrument for measuring distance electronically between two points of electromagnetic wave

→ EDM is a method of determining the length between two points, using phase changes that occurs as electro magnetic energy wave travels from one end of line to other end.
It is mainly two types

DDM or Direct distance measurement

→ This is mainly done by chaining and taping

optical distance measurement (ODM)

This measurement is conducted by tacheometry

Types of EDM instrument

1. microware instrument
2. Infrared "
3. light wave "

Total station

→ A total station is combination of EDM, and electronic theodolite microprocessor with memory unit.

→ with this device one can determine angle and distance from instrument to be surveyed

Shallow foundation

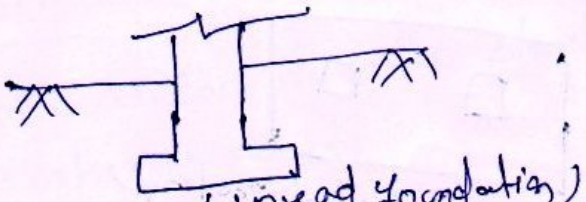
module - III

Shallow foundation

• Spread foundation

→ This is the most common type of foundation and it can be constructed using open excavation

→ This type of foundation is praticible for a depth of about 3m and is normally convinent above water table.

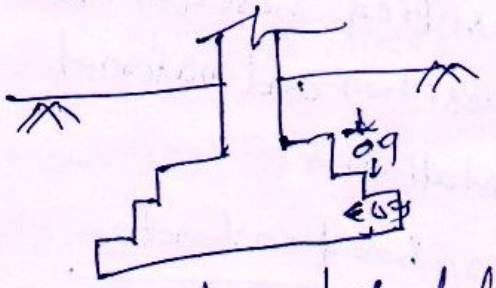


(spread foundation)

stepped foundation

→ In this type we have more than one projection on either side of width of wall. Generally the projections are provided at 15cm on either side

→ Thus the depth of each layer is atleast twice the projection and in general the depth is limited to 0.9m



stepped foundation

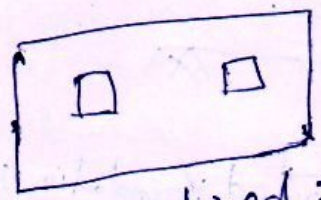
Isolated foundation

→ They are used to support the individual columns.

→ They can be either stepped type or have projection on the base concrete

Combined foundation

A combined footing supports two or more colum in row. The combined footing can be rectangu or trapezodal and it is provided if there is space



(combined footing)

Deep foundation

Pile foundation

Pile is an element of construction composed of concrete or steel or combination of them which is placed in ground either vertically or slightl inclined

It is classified based on following basis

(i) composition and material

(ii) Installation

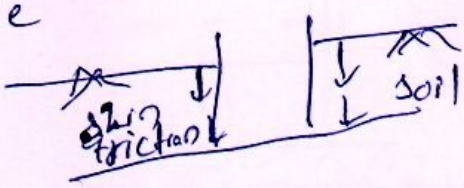
classification based on function

-) Bearing pile

- This pile are used to transfer load f pile load to pile tip to a suitable hard bearing through soft soil

Frictionpile

It is used to transfer load in a frictional material by means of skin friction along the surface of pile



compaction pile

They are use to compact granular soil in order to increase their bearing capacity.

uplift pile

These pile anchor down the structure subjected to different movements.

Irrigation engg

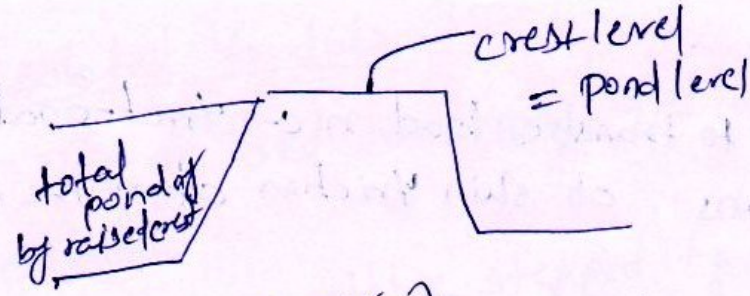
Irrigation may be defined as artifical application of water to the land in accordance with cropreqirements trough out the cropperiod for full-fledge nourishment of crop.

Canal headworks

The works, which one constructed at head of canal, in order to divert river water to canal so as to regulate continous silt free water supply.

weir

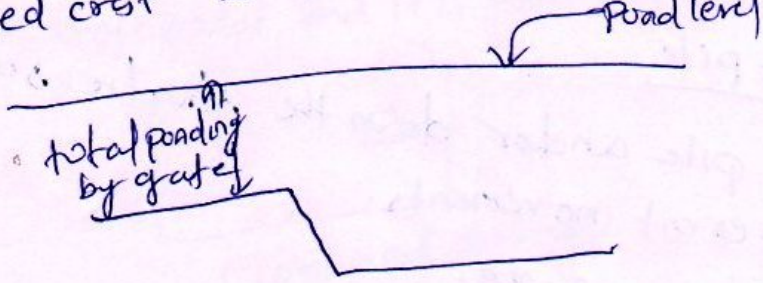
If the major part or entire ponding of water is achieved by raised crest and a smaller or nill part is achieved by shutter then it is called weir.



(weir)

Barriage

If most of the ponding is done by gates and smaller or nill part is done by raised crest is known as barrage.



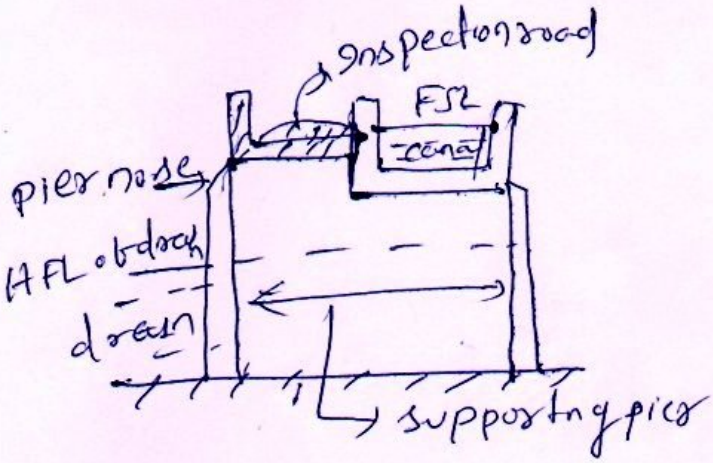
(Barrage)

Canal Sypho?

- It is classified into two types
  (I) Aqueduct
  (II) Syphon aqueduct

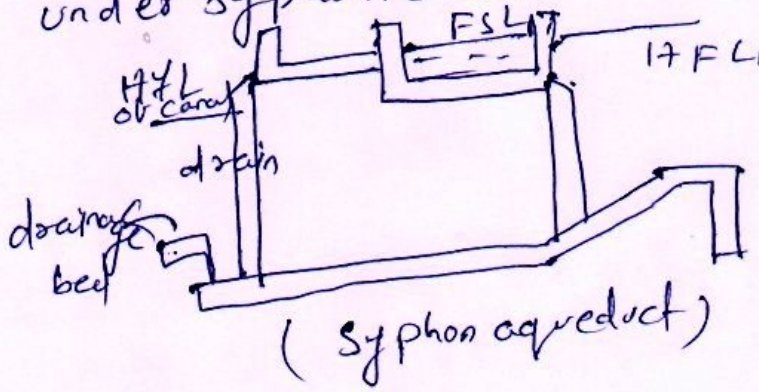
Aqueduct

When the HFL of drainage is sufficiently bellow the bottom of canal so that drainage water flow freely under gravity the structure is known as aqueduct



Syphon Aqueduct

If HFL of the drain is higher than the canal and the water passes through the aqueduct under syphonic action is known as syphon aqueduct.



(Syphon aqueduct)