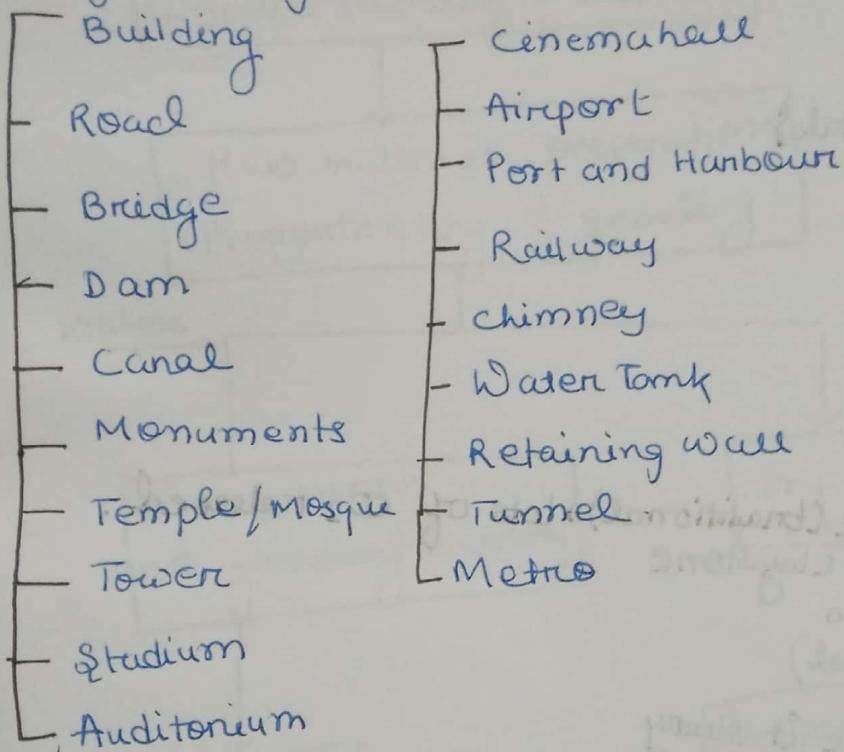


20/08/19

CIVIL ENGINEERING

HISTORY

- Civilisation and Non Civilisation
- Building :- Started with shade, cane and then mud huts
- Bridge - swings



21/08/19 Area of Civil Engineering

- ↳ Construction Engineers
- ↳ Structural Engineers . (design & analysis)
- ↳ Earthquake Engineers
- ↳ Geo-technical & foundation (soil) ↳ Project Management
- ↳ Irrigation Engineer
- ↳ Transportation Engineering
 - Highway
 - Railway
 - Metro
 - Port Harbour
- ↳ Remote Sensing .
- ↳ Urban Planning .
- ↳ Environmental Engineering .
- ↳ Infrastructure Development
 - ↳ Fluid Mechanics
 - ↳ Surveying .

Basic Civil Engineering Materials

27/08/19

- Cement
- Brick
- Concrete
 - Sand (Fine Aggregate)
 - Coarse Aggregate
 - Cement
 - Water
- Steel (Construction Metals)
- Stone
- Glass
- Timber
- Mortar
 - cement
 - sand
 - water

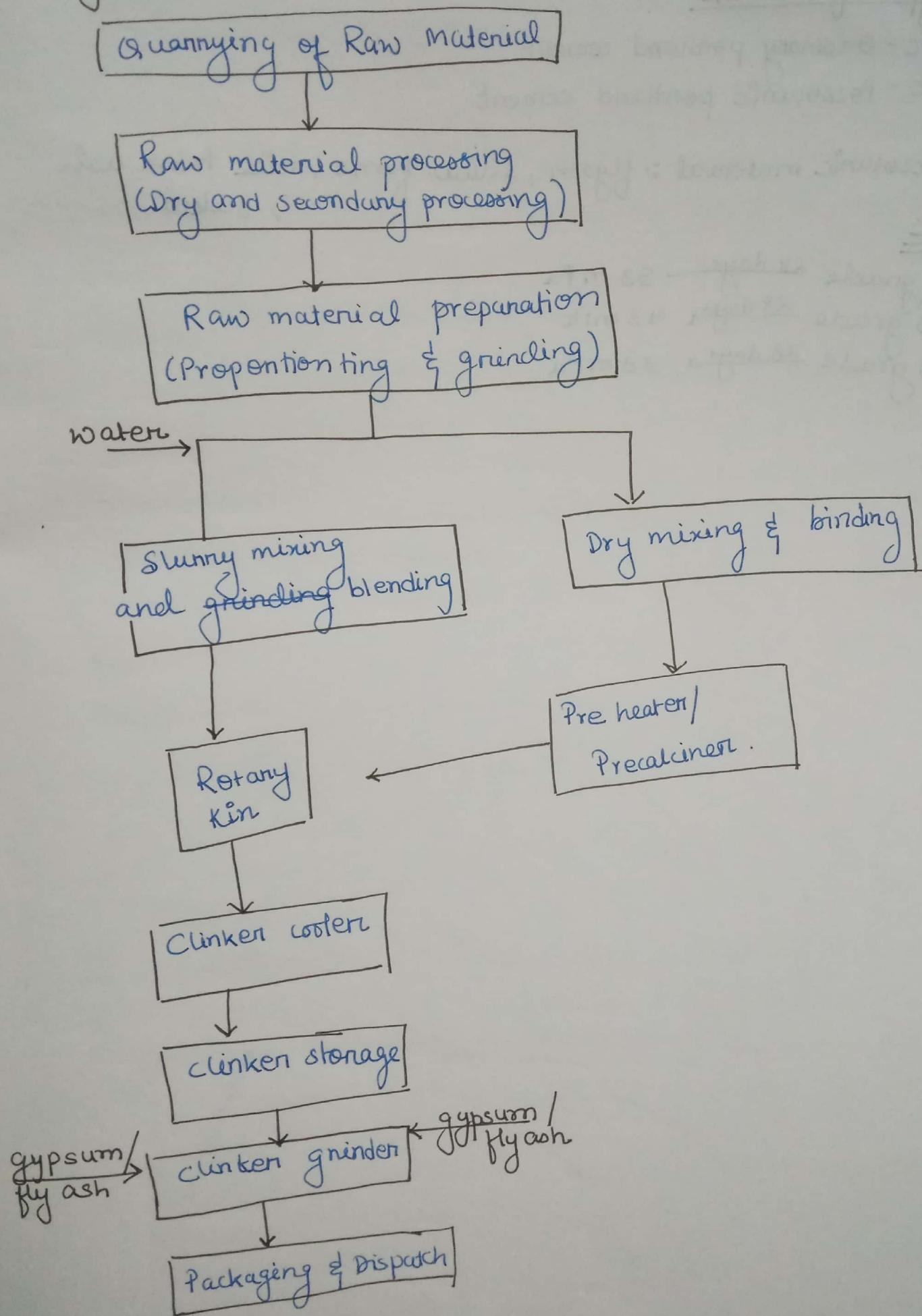
Cement :- Wet Process (Traditional) → Lots of CO_2 released.

1. Lime stone + Bauxite & clay stone
(Calcareous material) (Argilaceous Material)

2. Add water and make it slurry
3. Give temp of 1450°C to the mixture
(Rotary tin)
4. → Formation of clinker
5. Add gypsum ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$)
6. Grind the mixture
7. Collect the cement at storage tank.

Dry Process

28/08/19



Type of Cement

- OPC - Ordinary portland cement
- PPC - Pozzolanic portland cement.

Pozzolanic material :- flyash, silica fume, rice husk ash, gakri

OPC

- 33 grade $\xrightarrow{28 \text{ days}}$ 33 mPa
- 43 grade $\xrightarrow{28 \text{ days}}$ 43 mPa
- 53 grade $\xrightarrow{28 \text{ days}}$ 53 mPa

1st class	2nd class	3rd class	4th class
o These have well stan - dard shape and size	marked edges Lenticular Waveling		Stony Velvety Overhaught Hand dark color
o Buttin kin	Faded colour		
o crushing strength is 10.55 N 1 mm^2 (mm)	minimum $770/\text{mm}^2$ or Single shot - exp - not mass - creamy substance		

For good quality brick this shouldn't exceed 20%.

Efflorescence

→ Place the brick specimen in a glass dish containing water upto a depth of 25mm in a well ventilated room. After all water is absorbed again add water upto 25mm. Then after second absorption observe the brick for white & grey patches.

Patches

→ NIL

Obs:

No patches

→ SLIGHT

upto 10% of area covered w/ patches

→ MODERATE

10 to 50% patches

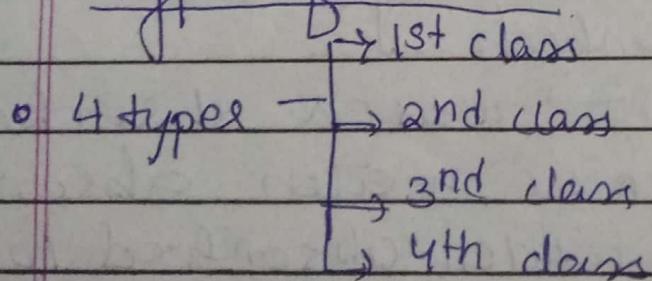
→ HEAVY

More than 50% but unaccompanied w/ flaky surface

→ SERIOUS:-

more than 50% but flaky surface.

Types of Bricks



BCE

- Crushing Strength: The brick specimen is immersed in water for 24 hrs. The frog of the brick is filled w/ 1:3, cement-sand (cement mortar) ratio and the specimen is stored in damp jute bag for 24 hrs. Then ^{immersed} in clean water for 3-days then the specimen is placed in compression testing machine with 6mm plywood on top and bottom surface of the specimen (to get uniform load on the specimen).

The load is applied axially at uniform rate of $40N/14N/mm^2$. The crushing load is noted. The crushing strength is calculated in ratio $\frac{\text{crushing load}}{\text{area of the brick}}$. The avg. 5 specimen value is taken as crushing strength.

WATER ABSORPTION

Weight

- Take a brick specimen and ~~weight~~ in dry cond'n than immerse in water for 24 hrs. then the specimen is taken out and wiped w/ a cloth and again weight in wet cond'n.
- The difference in weight indicates the water absorbed.
 $w_2 - w_1 \rightarrow$ water absorbed.
- The percentage of water absorption is ratio of water absorbed to dry weight $\times 100$.
$$\frac{w_2 - w_1}{w_1} \times 100$$

Managing I/P and O/P operations

#include <stdio.h> → header file.

↓
pre-processor
directive.

Unformatted I/P & O/P functions

- getch() :- reading a single character is done through getch();

syntax :- variable-name = getch();

e.g. char name;
name = getch();

Writing a single character :-

To print 1 character at a time on the screen

we use a function putchar();

syntax :- putchar(variable-name);

Symbolic Constants

Certain unique constants are used in a program that may appear repeatedly in number of ~~places~~ places in the program such constants can be defined using symbolic constants.

```
#define symbolic constant name value
```

e.g

```
#define PASS 50  
#define PI 3.14
```

Advantages

- ↳ understandability
- ↳ ease of modifiability.

Renaming datatypes with "typedef"

The purpose of `typedef` is to rename an existing variable type.

Syntax: `typedef datatype identifier;`

The datatype refers to any of the existing datatype and identifier refers to the new name given to the datatype.

e.g

```
typedef int units;  
typedef float real;
```

07/09/19

- Ground Moulding :- Rough surface
- Table Moulding :- Smooth surface.
- Machine Moulding

Hand Moulding
(Time taking)

→ Plastic clay Machine (addⁿ of water)

→ Dry clay machine -(w/o water) → No drying required.
↳ compressed

Ground Moulding

↓
Slop moulding base
(water)

↓
sand moulding base
(sand/flyash)

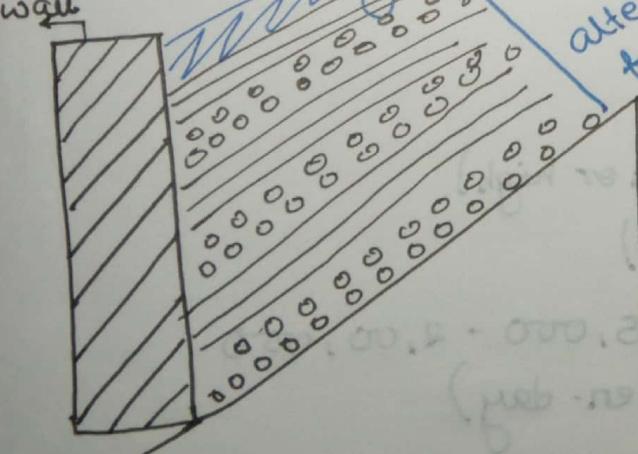
Drying :- To reduce the moisture content and save fuel.

- To avoid chances of crack
- Increase the strength of raw brick. (so that it can be stack)

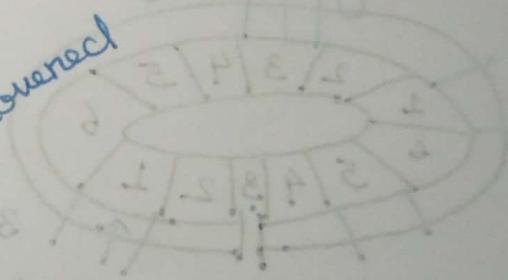
Burning

→ clamp burning (parawah)

→ kiln burning (Bhutta)



alternative fuel and brick layer w/ top covered with mud



Total brick making process
(According to traditional method)
time = 6 months

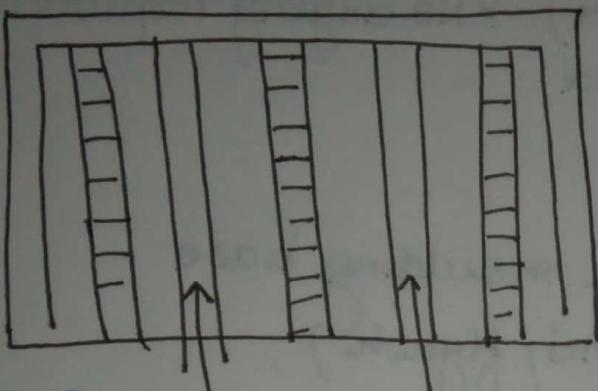
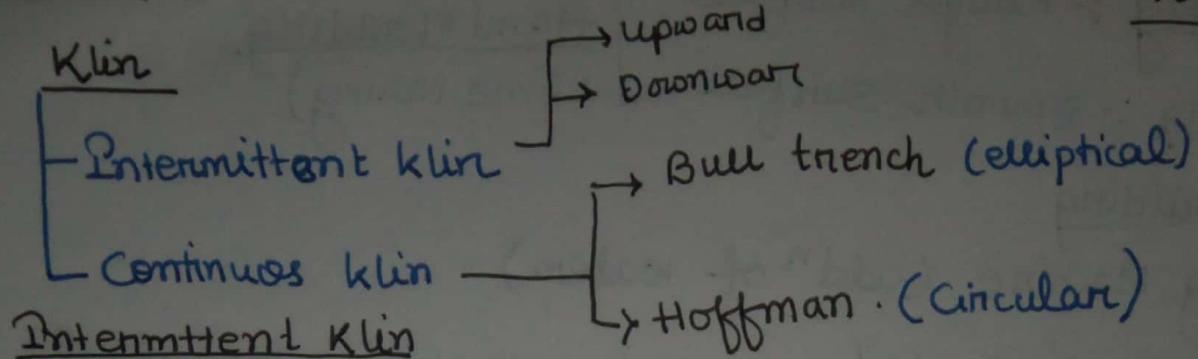
Clamp Burning Advantages

- Bricks are tough and hard
- cheap and economical
- No skilled Labour
- Lot of fuel saving

Disadvantages

- slow process
- Regulation of fuel not possible
- Irregular shape of brick
- Quality is not uniform.

10 | 09 | 19



Pre-heated
Burned
Cooked

Continuous Klin

- Loading ◦ Empty ◦ Preheating ◦ Heating ◦ cooling ◦ unloading



Bull Trench

1. Loading
2. Empty
3. unloading
4. Cooling
5. Heating (fast or high)
6. Heating (low)

(On average in continuous klin 2 5,000 - 2,00,000
bricks can be manufactured per day)

Test on Bricks

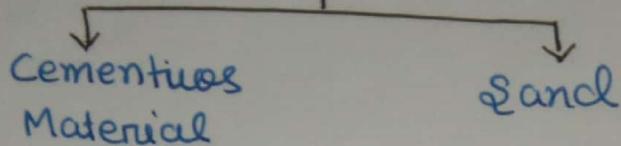
- Physical test
- Laboratory test

- color - uniform
- shape and size - edges are st. or curve
 $20 \times 19 = 380$ Length wise $19 \times 9 \times 9$ or $19 \times 4 \times 5$
 $3680-3920 \text{ mm}$
- strength → drop from 1m breadth wise
1720-1860 mm
- hardness - scratch - if impressioned bad quality or else good
- soundness - hit two bricks together - if clear & metallic sound then good
- texture - hard - good, flaky / smooth - bad
- Durability
- Inner structure break it from centre and observe the inner structure to check presence of salt, gravel, void etc.
- Laboratory Test
 - Crushing strength
 - Water absorption
 - Efflorescence

Crushing Strength

12 | 09 | 19

* Cement Mortar



- Mortar is the combination of cementitious material and sand. While in cement mortar the cementitious material is cement.

Preparation:

1. Take one part cement and mix w/ 3 part sand
 2. Then the mixture is mixed thoroughly in dry condition
 3. After proper mixing add water equal to half the weight of cement
 4. Again the whole mixture is mixed thoroughly so that no water will be flow.

Uses

- Masonary structure.
 - In flooring surface
 - Plastering
 - Repair work

*Concrete

- Cement
 - Fine Aggregate (sand)
 - Coarse aggregate (gravel)
 - Water

→ Admixture (optional) : To enhance the quality of concrete.
(chemical or mineral).

Type of concretes

- (i) PCC (Plain Cement Concrete)
 - (ii) RCC (Reinforced Cement Concrete)

Reinforcement Bars (Steel Rod)

/Iron

→ Mild steel bars :- ductility is high, yield

250 N/mm^2

→ High yield strength

415 N/mm^2 or 550 N/mm^2

Deformed bar

(HYSD bar)

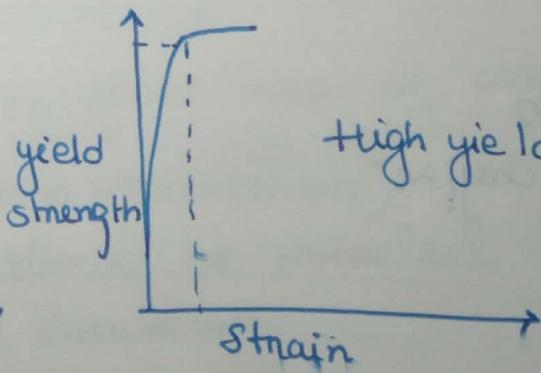
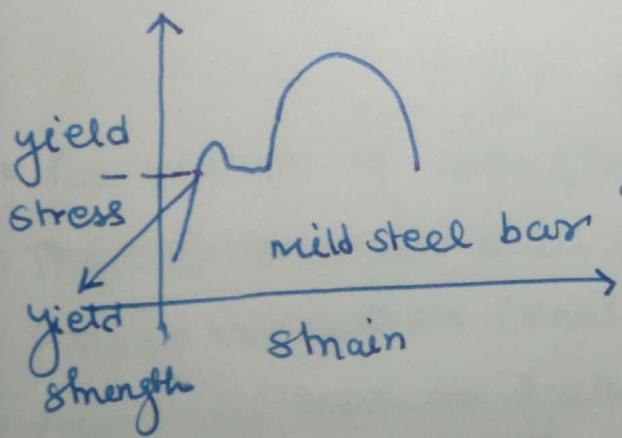


TMT bar

(Thermomechanical Treated bar)

• Strain = $\frac{\text{change in length}}{\text{Actual length.}}$

Yield strength



High yield strength bar

MID SEM: MOD 1 & 2

Building Planning

(019/09/19)

019/09/19

- Requirements
- Elements
 - Orientation planning
 - Environmental suitability planning
 - Utility Planning
 - Economic & feasibility planning

REQUIREMENTS OF BUILDING

- To take shelter.
- To store the material
- Privacy
- For various purpose
(To solve school, hospital, club)

Elements

- Foundations
- Plinth
- Walls and columns
- Sill, lintels and chejjas
- Doors
- Windows
- Floor
- Roof lift
- Stairs, Ramp
- Finishing work
(like plastering, painting etc)
- Building services
(like water supply, drainage etc)

Plinth :- It is the portion of the wall between ground level and ground floor level. Height $\geq 450\text{mm}$.

18/09/19

→ Planning According to Orientation

This includes setting up the plan of building according to East West North South direction to provide an opportunity to user to enjoy Sunlight and breeze.

- Kitchen :- E aspect
 - Dining room - S aspect
 - Living room - S or SE
 - Bedroom
 - Study room - N (diffused light)
 - Long Wall - N to S
 - Short wall W or SW
 - E to W
- Planning According to Energy efficiency or Environmental Suitability.
- Sunlight
 - Ventilation
 - Heat Insulation

Factors to be considered.

Soln:- Provide window and ventilator of appropriate size at suitable position.

Window area = $\frac{1}{10}$ th of floor area of concerned rooms (residential)

= $\frac{1}{5}$ th of floor area of concerned room.

- Circulation of air. (Cross ventilation)
- Thicker exterior wall should be provided (Heat Insulation)
- Proper Ventilation (Heat Insulation)
- Assembly hall or factory should be more height.

→ Planning According to Utility

▲ Roominess

The length to width ratio is standardised as $1:2$ (length) to $1:5$ (width).

- If width < 1.5 then tunnel effect is seen.
- Proper connection to wall and floor.
- Floor tiles

▲ Furniture Requirement

- Groupings :- Dispositon of various group rooms in the building for the convenience of the user.

• Balcony or verandah - east or west

• Chajja - s

Circulations

Lobby, passage, corridor, floortiles - horizontal circulation

Other Requirements

- Sanitary convenience
- Prospects
- Flexibility
- Elegance
- Privacy
- Fire resistance
- Sound Insulation
- Protection from temmle
- Security against burglary
- Economy
- Provision for future alteration.

19/09/19 TYPES OF BUILDING AS PER NBC (National Building Code)

- ↳ Occupancy
- ↳ Transfer of load in structure
- ↳ Degree of fire resistance
- ↳ Materials used.

Factors to be taken care of
(To be considered)

Types

1. Residential - sleeping, accommodation, dining (e.g hotel, lodge, house, cottage)
2. Educational
3. Institutional
4. Assembly
5. Business - office, exchange bank
6. Mercantile - shop
7. Industrial - sawmill, manufacturing hub, power plant
8. Storage - Godown, cold storage hub
9. Hazardous - Flood shelter house, Tunnel or Bunker

- Residential
 - Hut
 - Semi-attachable
 - duplex
 - flat
 - bungalow

Site Selection

→ Soil Quality

• (Soil bearing capacity) SBC

→ Flow of ground water

→ accessibility to different utility (Rlw station, Bus stand, Road)

→ flow of drainage water.

Components of Residential Buildings and its construction

- Foundation
- Plinth
- Floor
- Wall & Column
- Door, Window & Chejja
- Roof
- Balcony
- Stairs, Lift, Ramp
- Corridor, Passage

SURVEYING

It is the measurement of an object on, above and beneath the earth, to show their relative position on a paper.

Surveying: measurement along horizontal

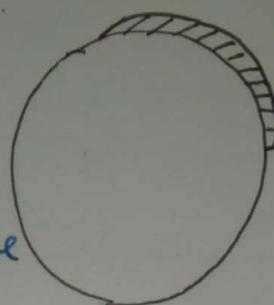
Levelling: measurement along vertical.

- Objective
 - Plans are prepared to define public and private property to avoid conflicts.
 - Plans are prepared to mark boundaries of country, state, district, localities etc.

- Planning and estimation work like road, bridge, waterway airports, dam, canal surveying is required

① Whole to part

For larger area a set of control points, identified w/ highest precision. Then secondary control points are located using less precise method.

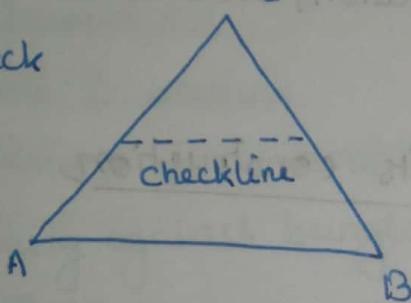


Large - high precision

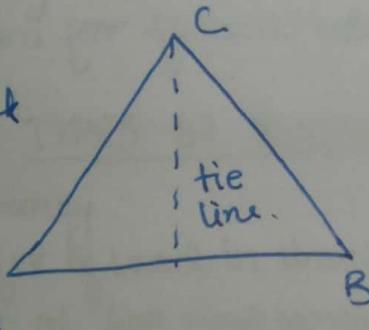
Small - Low precision

② Extra care is taken for fixing position of new control point.

1st check



2nd check



Types of Surveying

based on Nature of survey field

Land Survey
Marine or Hydrogen survey

based on instrument used

Astronomical Survey

based on object or purpose of survey

based on method employed

- Based on Instruments used
 - Chain
 - Compass
 - Plane Table
 - Theodolite
 - EDM and Total Station
 - Tacheometry
 - Aerial survey
- Based on Object or purpose of survey
 - Engineering Survey
 - Millatary Survey
 - Mine survey
 - Archeological survey
 - Geological surveying
- Based on method employed
 - Triangulation
 - Transverse
 - Open
 - close