Lis

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18/02/20 CVE 301

Line - The basic of all drawings. A series of dots connected together

Dimensions and lines have to go together

Types of line

Continuous line

Construction lone

Centre lines

Hidden lines

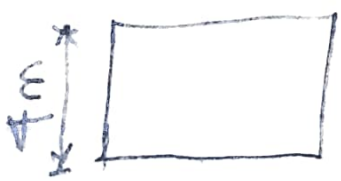
Assignment 1

- Learn about all the types of lines available in all areas. (auto CAD)

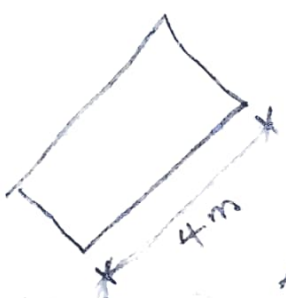
Poly line (auto CAD).

Dimension line

1. Linear dimension line. - Straight (horizontal or vertical) It can be called aligned dimension

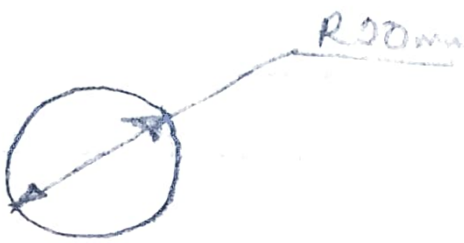


Linear dimension



Aligned dimension

2 Radial dimension

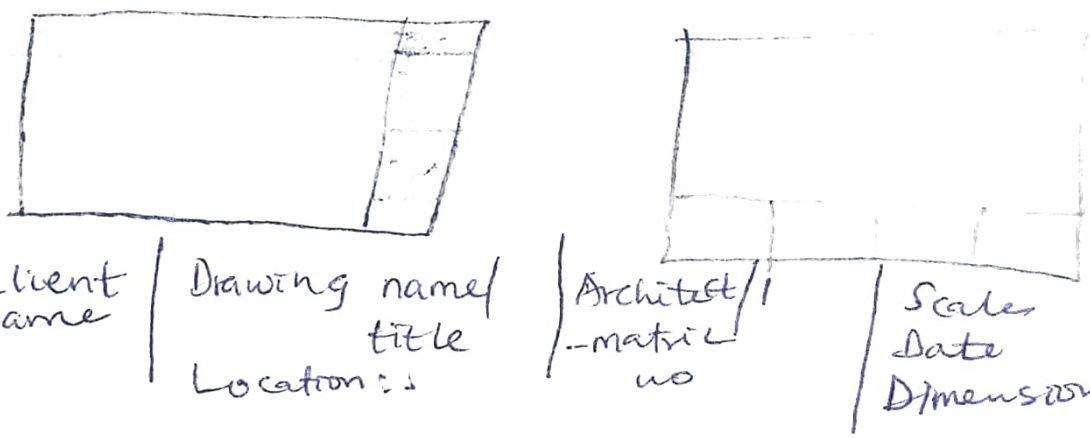


3 Continuous dimension.

Characteristics of dimension lines

- It must have a dimension value
- It must have an arrowhead - to mark boundary
- It should have an extension line
- It must have a unit of measurement

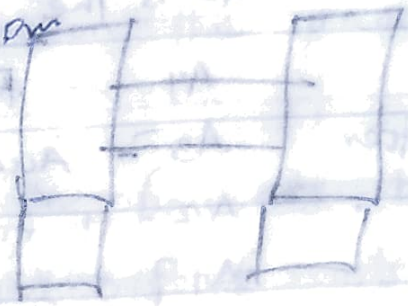
Layout of Drawing
-Border line.



Assignment

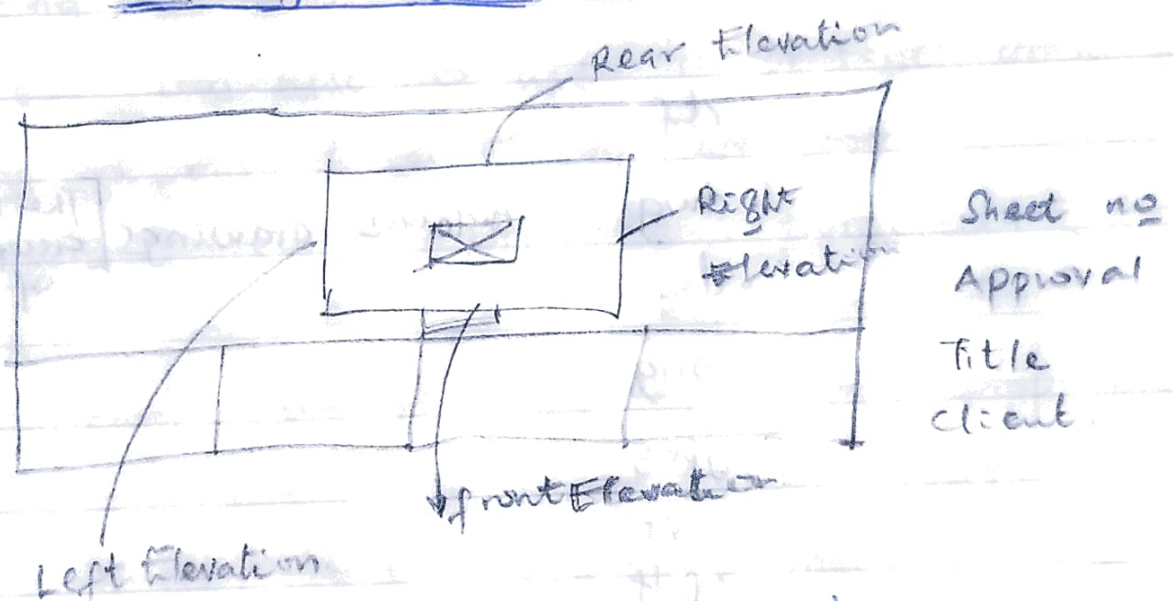
Free-hand drawing (A3 paper)

Mechatronics building floor plan



25-02-2020

Drawing Layout



Different from building plan.

Survey plan shows the north

Regardless of the orientation of the land, the shape of the building should be positioned so that the front elevation faces the title block.

Drawing Sheet Sizes

A3 is the standard obtainable paper externally.

A4 — For working drawing 297 X 210

A5 - Jotter.

A3 - Acceptable everywhere. (2 times A4) 420 x 297

A2 - Large scale buildings. eg Dams 420 x 594

A1 } - 594 x 841
A0 } - for contour drawings of entire towns

Drawing Formats

- rtf
- dwg — AutoCAD drawings [The internationally acceptable format of drawing.]
- dxf
- png
- jpeg
- rvt
- pdf

dxf - drawing exchange format. All CAD Softwares will also load drawings of this format. Best for exchange between other CAD softwares.

Orion
Star pro

- dwg and dxf can be edited/altered.

dwg and dxf formats are referred to as vector drawing. Each point on the page has an x and y - plane.
Other softwares can load these formats because they pick the x and y components of points.

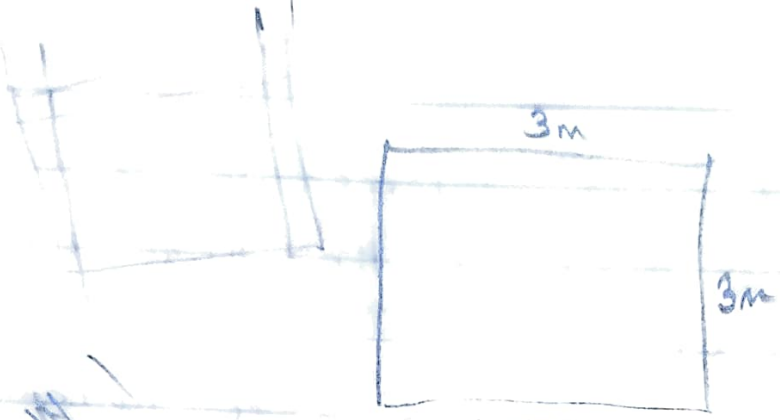
- pdf - Difficult to edit. It is a way of protecting drawings.
- png - can also be used to present drawings. It is not easy to edit png and jpeg
- pdf formats can be locked and protected.

- rvt - Revit develops buildings with components e.g walls, columns, windows, slabs, roofs e.t.c. Revit is faster, but autoCAD is more flexible.

Drawing scales

1:50
1:25
1:100
1:150
1:200

1 unit on the paper = 100 units in reality / on the ground.



$3m = \frac{3000\ mm}{100}$ $30mm = 3cm$.

1 : 100

1 : 150 $\frac{3000\ mm}{150}$ $20mm = 2cm$.

Walls should be scaled. All other features should also be scaled.

Scale 1 : 100 is common for a normal building drawing

Scale 1 : 50 - can be used for elevations or some parts of buildings

Scale 1 : 25 - Details / Small details.

1 : 25 - lintel

1 : 50 - column.

- One scale for the entire picture of drawing.
- Another Scale for different details.

Types of Drawings

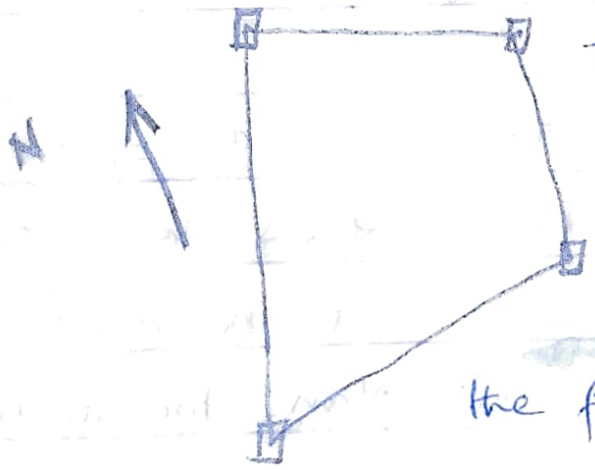
- Survey
- Site Plan
- Floor Plan
- Elevations
- Roof Plan
- Sections
- Details

} Architectural Drawing

3D

Survey plan – Shows the bearings and orientation of the land. The orientation of the true north.

The surveyor most times produces the survey plan



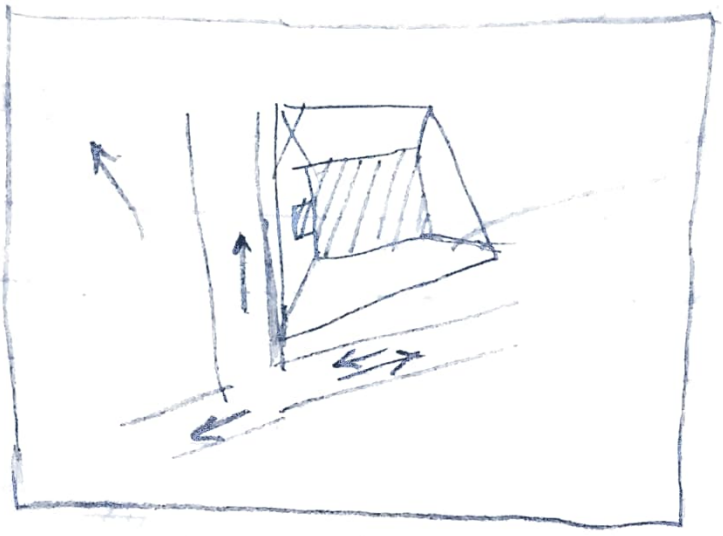
To know how and where to position some features e.g east for sunrise e.t.c

The survey plan is always the first and impotant plan

Site Plan – The survey plan is used to draw the site plan. The site plan shows how to access the location. It should show the location of the building

Shows the location of the building

road. for housing estates, plot block plan is needed



minimum 1.8 m.

The outline of the building should be shown. There is also a minimum distance between the centre of the road to the entrance of the house (6m). Expressway - (50m) or 25m, 12m

Building line.

Floor Plan - Shows the wall and other details It shows the windows, doors and other parts of the building must be labelled. It is the most important plan. For multi-storey buildings, we may have the ground floor, first floor plan, Second floor plan e.t.c. If they are identical, it can be "Ground floor and first floor plan" e.t.c.

Assignment

Draw a one bedroom flat floor plan showing the following features:

Scale: 1:100

Toilet/Bath

Sitting room

Kitchen

Bedroom

03/03/2020 The floor plan contains some vital information. Residential buildings are different from institutional buildings. The no of toilets is determined by the number of people using the building.

Religious type floor plans (churches, mosques) are different from residential or institutional ones.

Industrial buildings are also different. Warehouses can be present

Recreational structures → swimming pool, sports complex etc

Client brief. - The client talks about the type of building

A bungalow is a structure with only one floor,

Which is the ground floor.

Duplex - has more than one floor. One suspended floor.

The engineer asks questions about the structure the client wants

- How many rooms / sitting rooms?
- The size of the rooms,
- The environment
- Master bedroom, other bedrooms etc.

- Room in-suite - containing toilet and bath, a space for dressing, wardrobe / closet.
- Limiting cost by sharing facilities.
- Size of kitchen
  Store / pantry
- General Storeroom
- Laundry corner / room or Expansion of toilet / bath to accommodate washing machine.
- Library
- Prayer room

It is good to ask for the survey plan before drawing, so as to manage space. The survey plan

will show where the road is located.

The floor plan can be used to set-out when building. All other plans are secondary.

Sitting room is different from living room. The living room combines both sitting room and dining together

- A house should have more than one entry/exit.

2 or 3 entrances/exits is okay for a residential building.

Space - Take notice of space management.

Shape of the plan - Let the drawing not have too much irregular shape.

Walls - 150 - 6 inches block 225 - 9 inches block

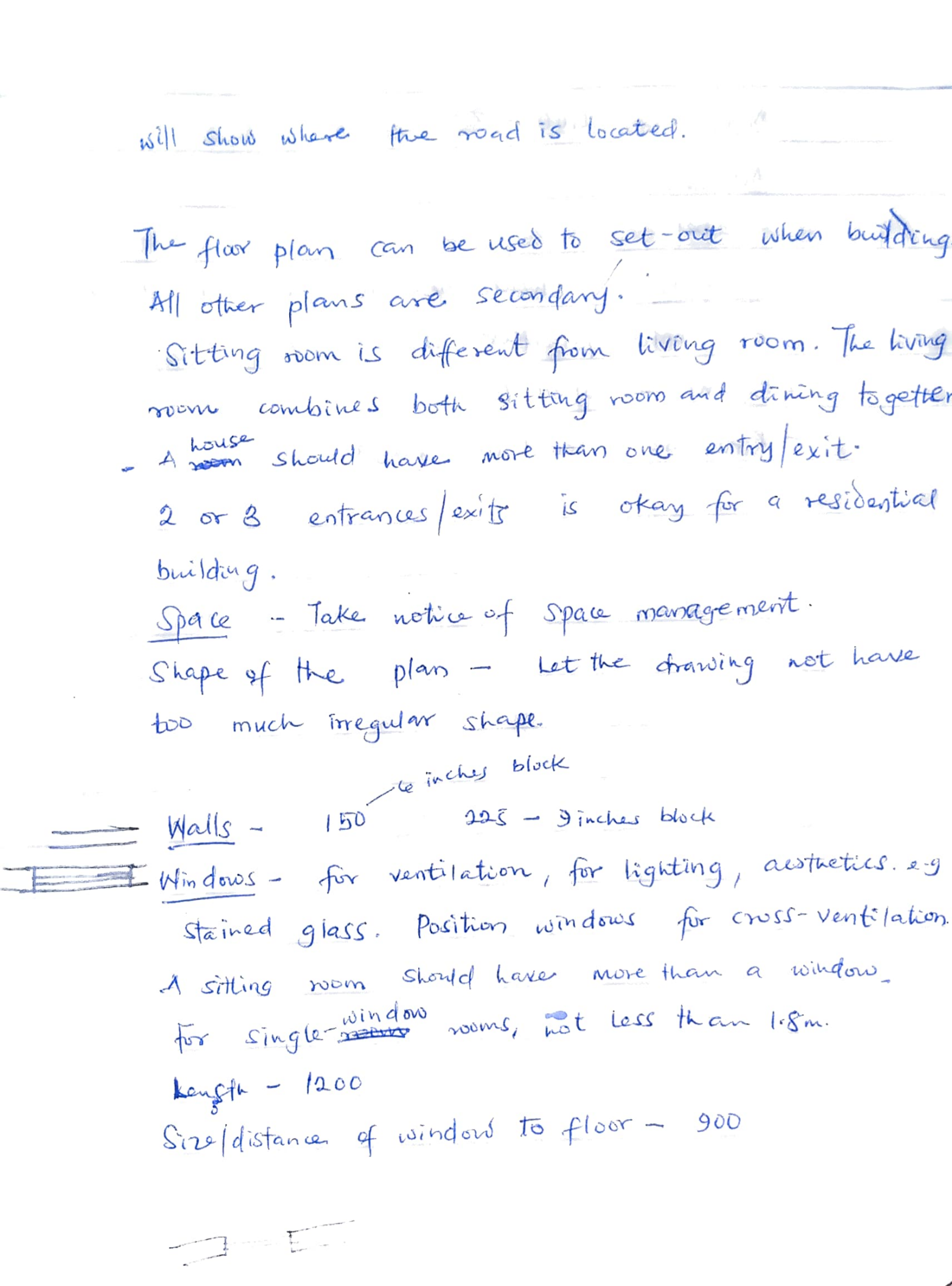
Windows - for ventilation, for lighting, aesthetics. e.g stained glass. Position windows for cross-ventilation.

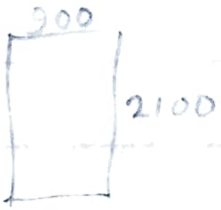
A sitting room should have more than a window.

for single-window rooms, not less than 1.8m.

Length - 1200

Size/distance of window to floor - 900





Doors - 2100 → height

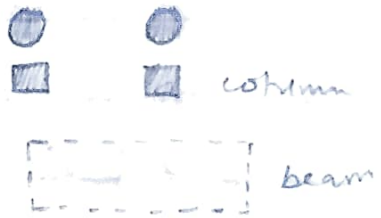
Dimension

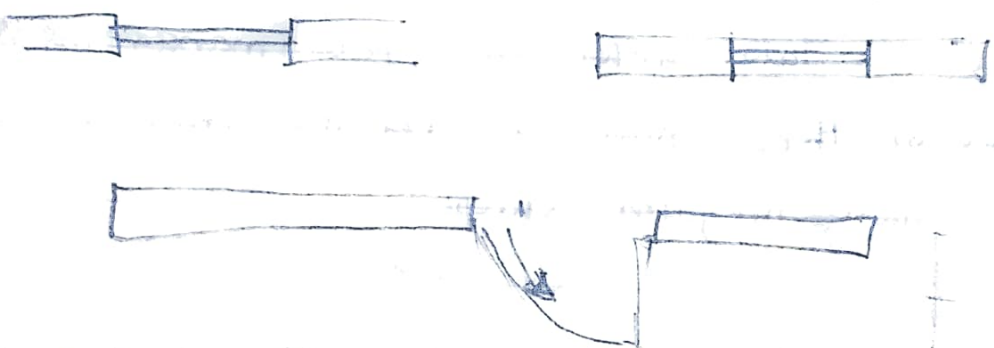
- Label

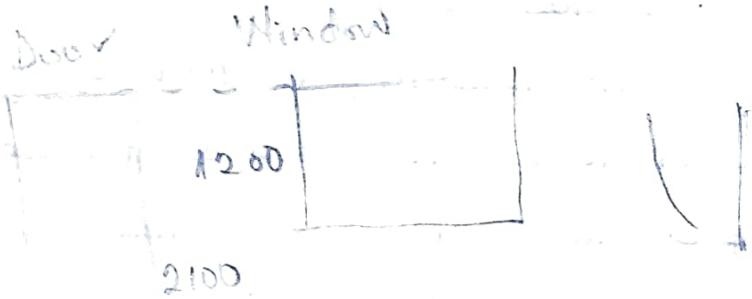
- Columns - should be identified. The columns are bolder / darker / shaded.

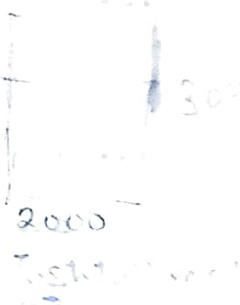
- Beams - Dotted line

- Furniture - Small line weight

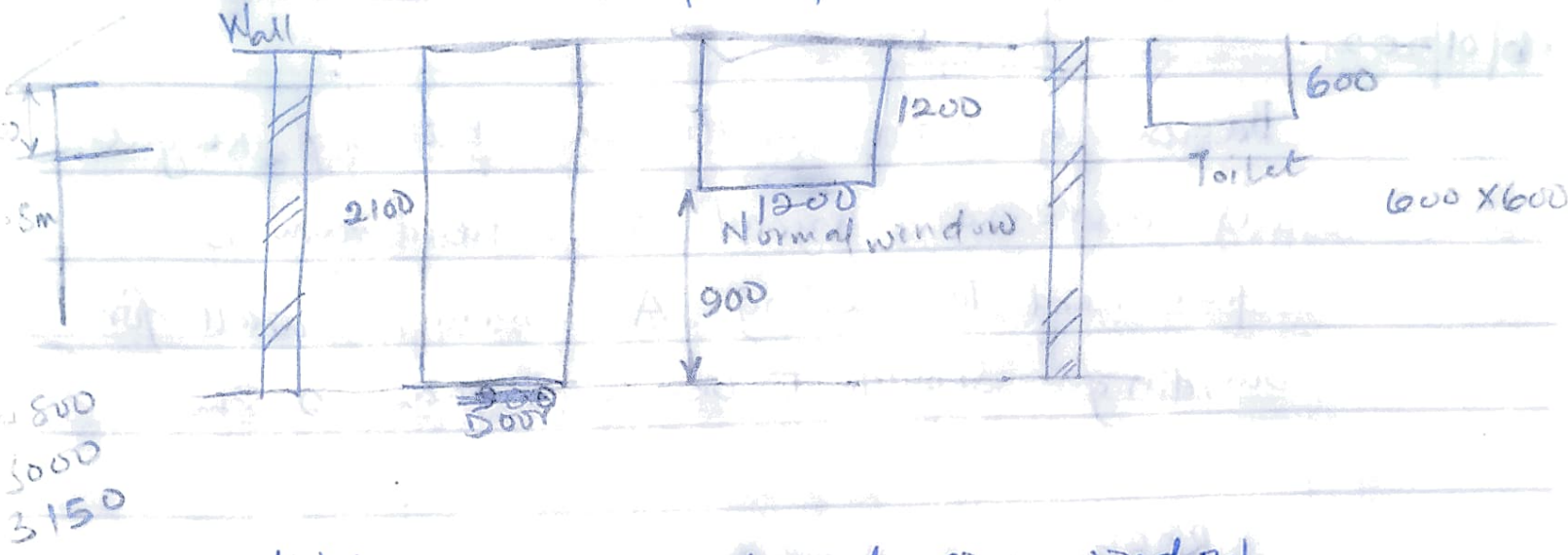




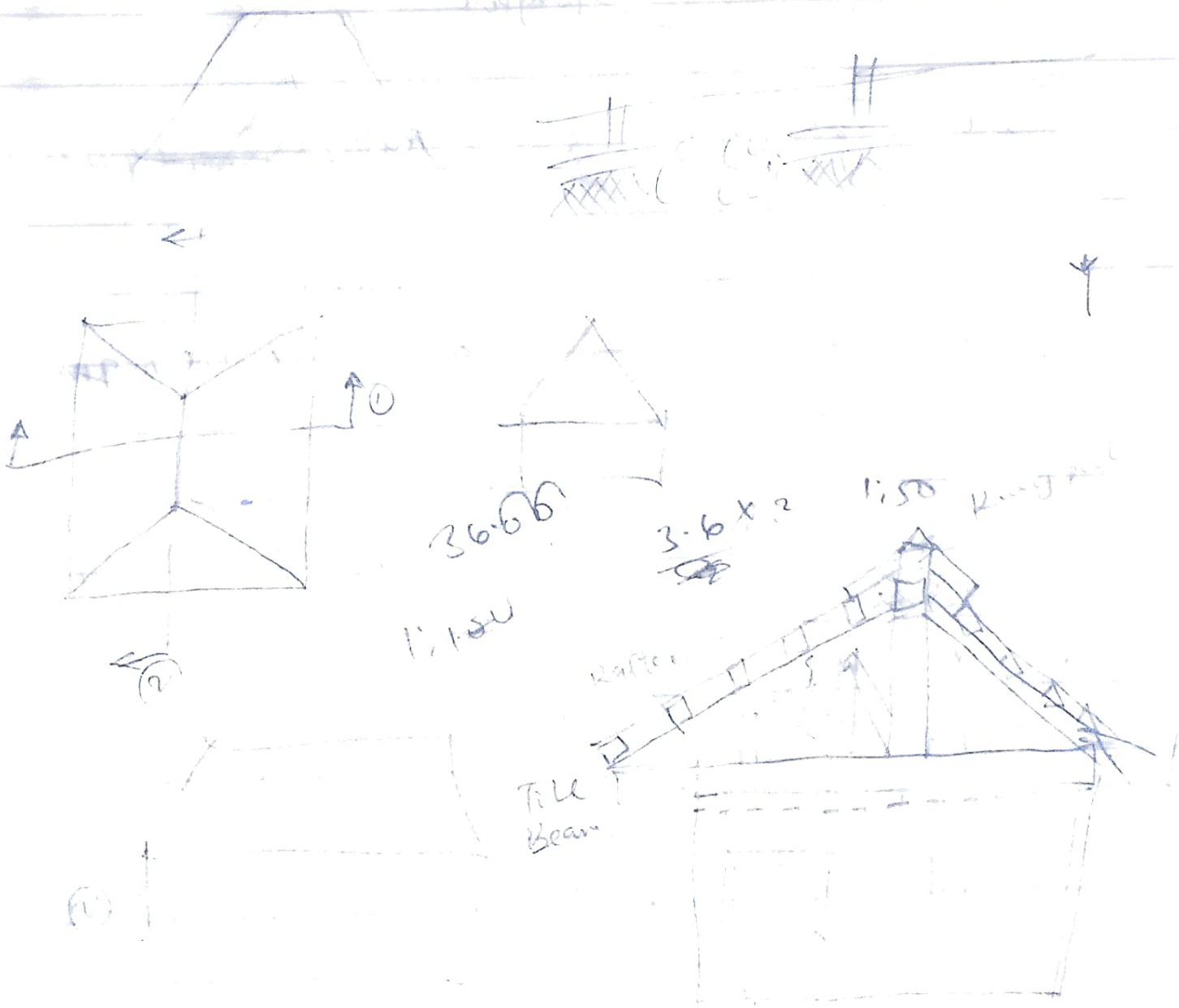




Window - multiples of 600. [1,200, 1,800] etc.



Kitchen window - Normal size window

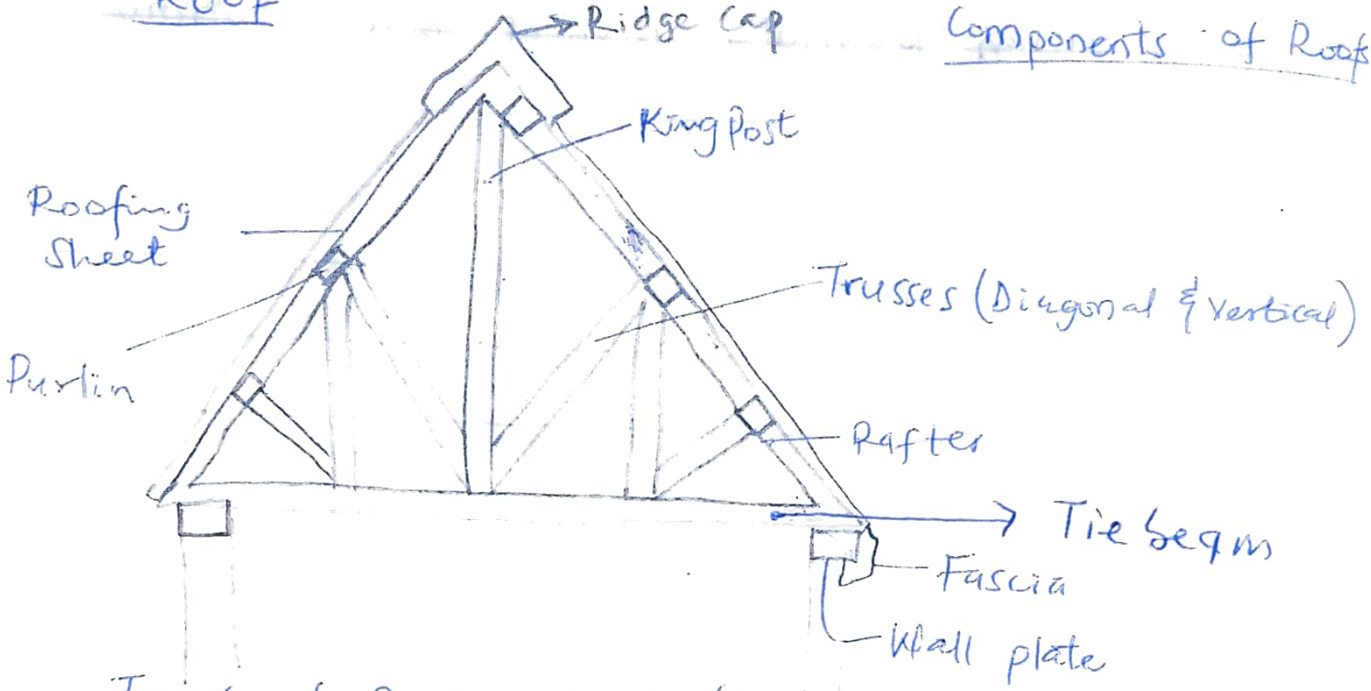


26/01/2021

Roofs

Because of beam multistorey building. Height is increased beyond 3m. Head room is from head to ceiling. A normal wall for building Shouldn't be less than 2.8m.

ROOF



Components of Roof

Types of Roofing Sheet (Specify when drawing)

→ Aluminium, Iron sheet, plastic fibre

* Under roofing sheet, we have trusses, which could be of wood, steel [optional concrete, plastic].
* Next to the roofing sheet is purlin, which could be mostly 50mm by 50mm, 2 * 3 (50mm x 75mm)

Trusses could be vertical or diagonal.

To start a roof

- Wall plate
- Tie Beam
- King post
- Rafters
- Diagonal & Vertical Braces / Trusses
- Purlins
- Roofing Sheet
- Ridge cap

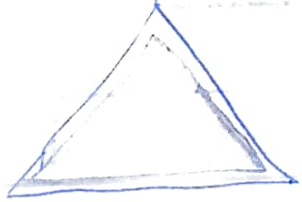
Top → Bottom

Types of Fascia → check up.

Ceiling board, plywood, POP, Asbestos

↳ check up what it is made of

- Ridge cap
- Fascia
- Roofing Sheet (s)
- Purlin
- Vertical & Diagonal Trusses
- Rafters (50 x 100 mm)
- King Post (50 x 150 mm)
- Tie Beam (50 x 150 mm)
- Wall plate (75 x 100 mm)



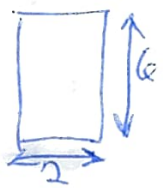
Specify → materials, dimension, sizes, angles, double angle steel, wood,

(1) Size of wall plate → 3 × 4 → resting on the wall.
↓
Vertical

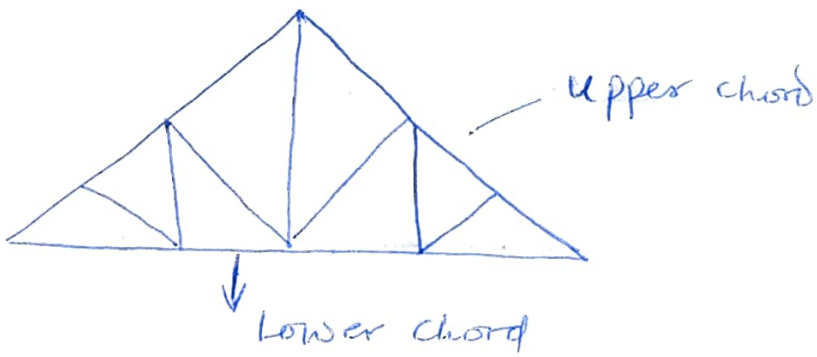
(specify the type of wood e.g hardwood)

(2) Tie Beam — 2 by 4 (current use)
2 × 6 (previously)

2 — 50mm
3 — 75mm
4 - 100mm
6 — 150mm



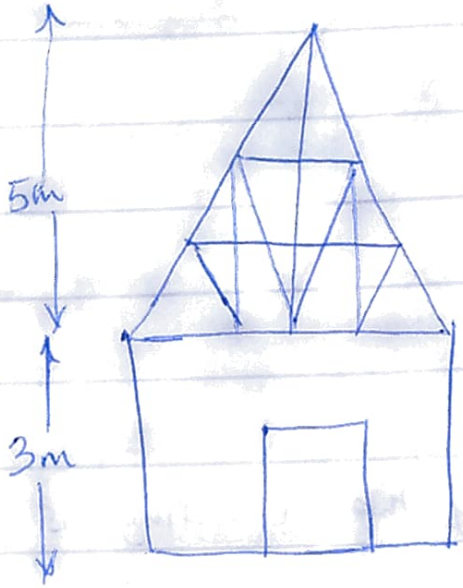
For steel trusses (specify materials)

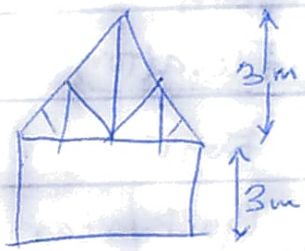


* Check up steel trusses with specified diagrams
* Slope of a roof → does not have standard angles

High slopes tend to resist wind (Take note).
- In terms of cost, it may not be economical
- 15°, 30° above is okay. (30°)

A high roof will require lots of horizontal and diagonal braces





Assignment

Draw a 2-bedroom bungalow, showing the section of the roof

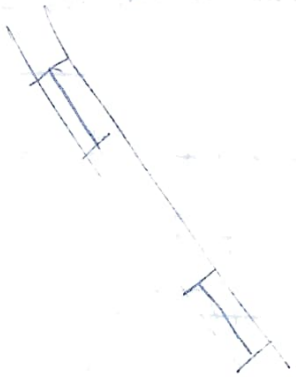
→ Dimensions in mm

→ Slope of roof is 30°

02-02-2021

Elevations

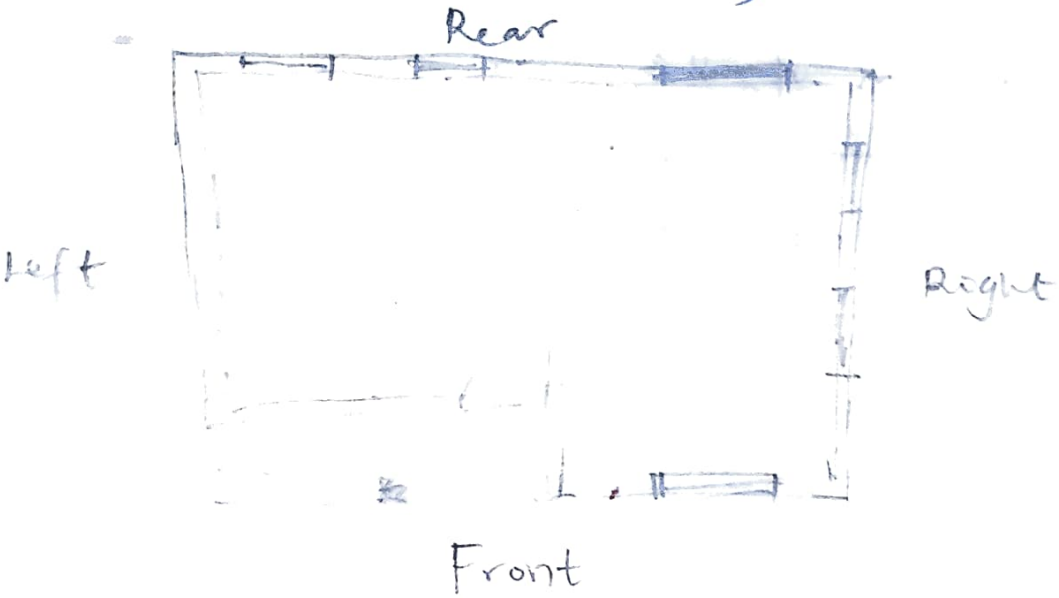
- Dimensions
- Perspective projections
- Roof plan
- General Sections



Elevation

- Front
- Back/rear
- Right side
- Left side elevation.

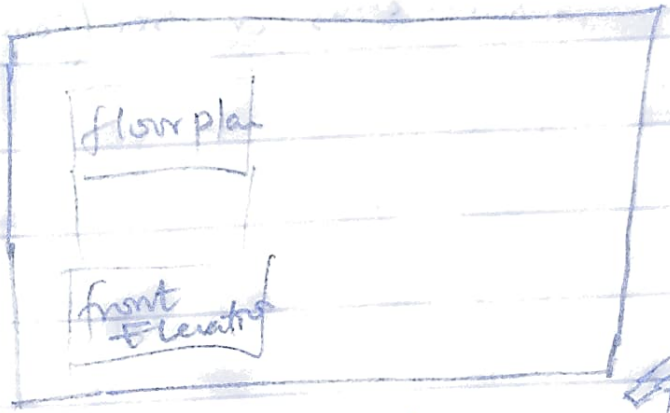
Elevation is the way the building is viewed from the outside. either from the front, side (right or left) and the rear. Elevation does not include what is inside the building



Easier method

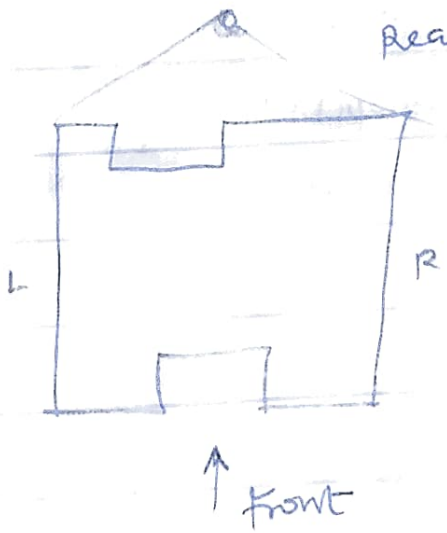
Use lines to project the floor plans.

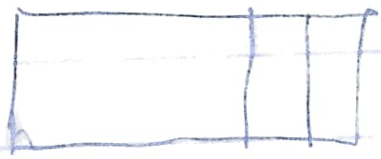
Manage space such as to project the floor plans to draw the ~~floor~~ elevations.

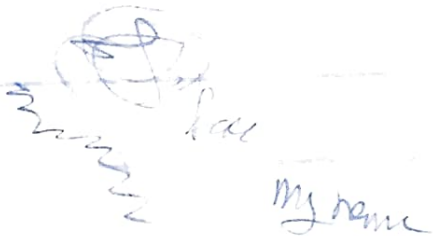


- Height of building (bungalow) = 3m
- Let the projections be faint lines
- Measure the height of the window from the floor traditional (900mm) (0.9m)

09/02/2021



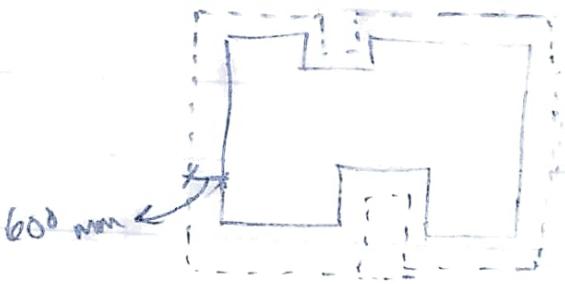




Barry Roof Building/building services

Roof Plan

- Eave projection (What projects outside the external walls? Traditionally, should be 600mm 750mm in some cases or 500 (concrete fascia).



Ignore sometimes

-- Flow The roof pattern determines the flow

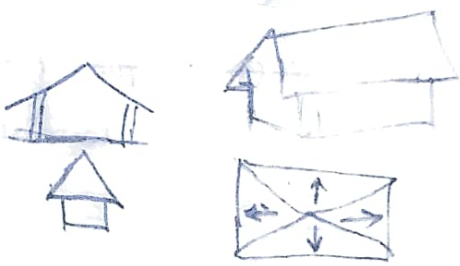
-Roof pattern

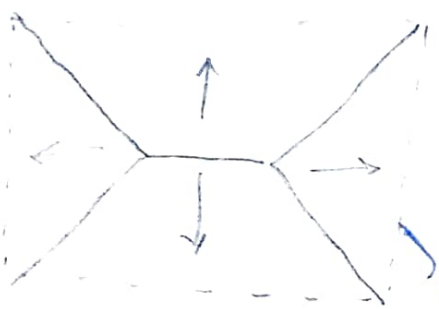
Gable

Heap

Monopitch

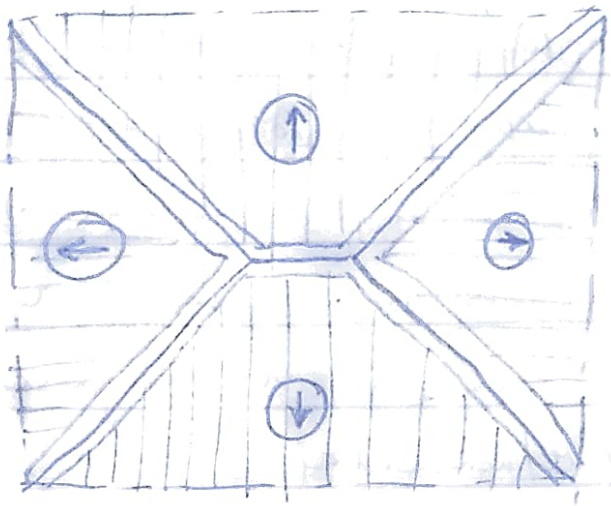
Butterfly





- Ridge cap
- corrugation of the roof
- No internal structures

continuous line not dash line



- Indicate the direction of flow
- Roof gutter controls the flow of water.

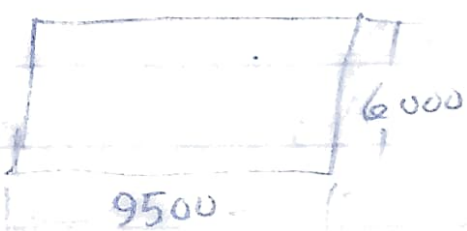
on paper

1 : 25

1 : 50

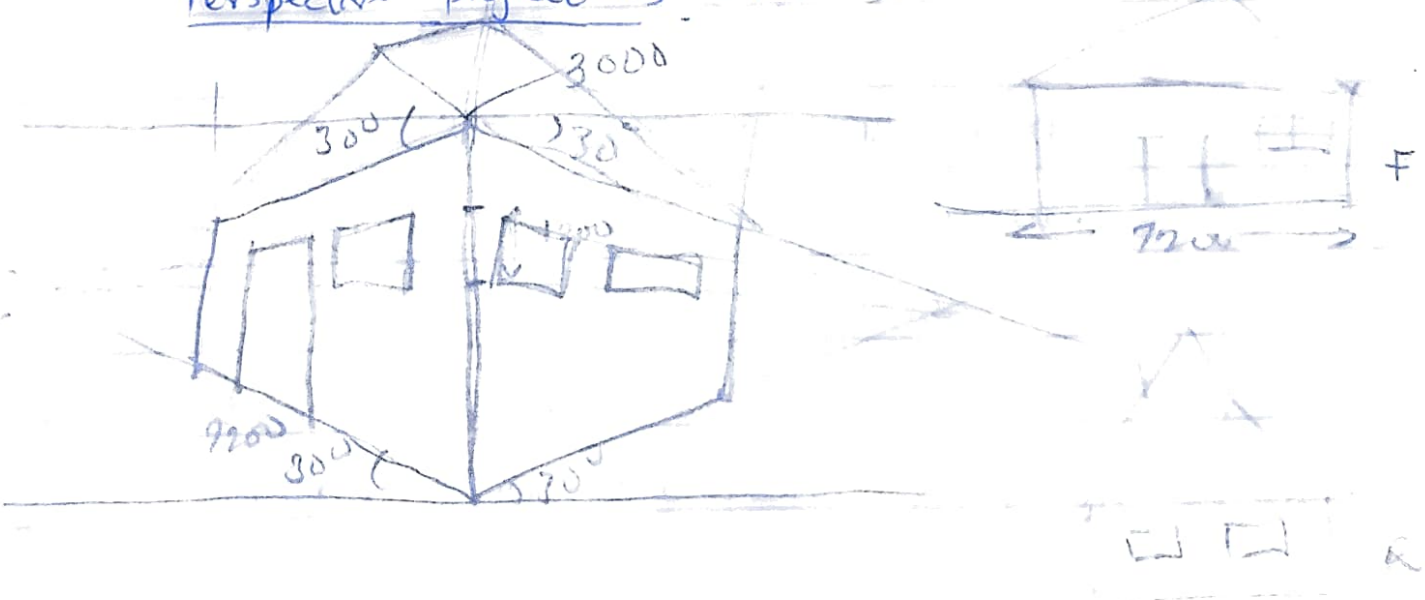
1 : 100

6m 6000 mm



When dimensioning, dimension using the original ones, but show the scale used

Perspective projections - Looking from the corner



- Dimens

- Draw a horizontal line and pick a base point
- Measure a line up, perpendicular to the base line and mark the height of the building (3,000
- Angle 30° or 15° from the base point.
- We don't follow the angle at the base for the top. The top can be flat/horizontal
- Join the top & bottom lines until they meet

<u>Dimension</u>

Aligned dimension

Show detailed dimension and overall dimensions

Doors - With or without swing

Windows -

Internal dimensions also important - rooms, door

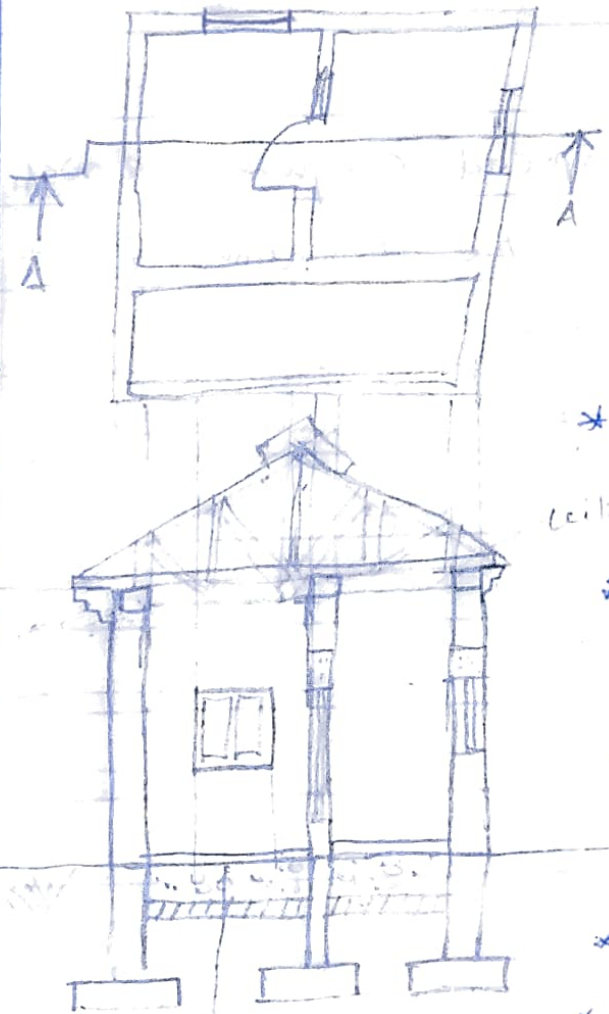
Any convenient distance can be used for the distance between the dimension line and building.

23/02/2024.

Revision

About 4 questions

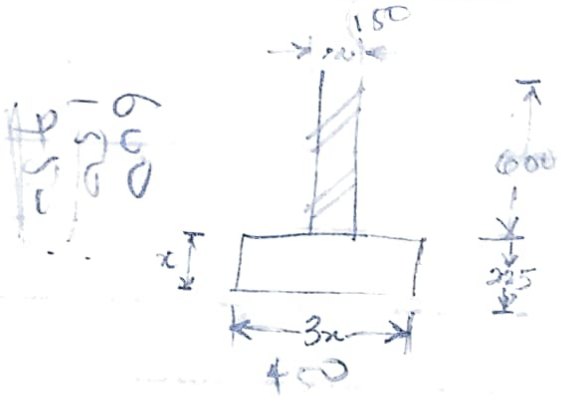
* - Reproduce the plan to scale [1:100, 1:50]
  - Flow plan
  - Elevations
* Section - Roof, building sections



* check where the section line pass through.
* check the direction of the arrow, showing the area to consider.
* You can start from any end.
* Put the thickness of the ~~door~~ wall before the thickness of the door.
* Measure the height of the building - 3000 mm
* Measure the eave projection
* Drop a line to indicate ceiling 500mm below (3,000).
* Window height, e.t.c.
* Show the lintel of the door & window

Foundation - for a bungalow, 900 ↓ deep

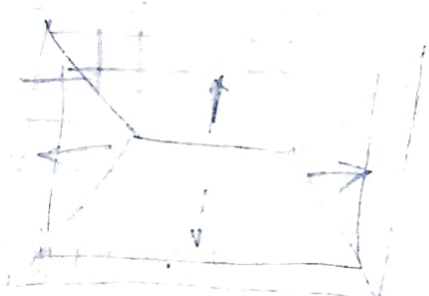
The thickness of the wall is also the thickness of the foundation. The width of the foundation is 3 times the thickness.

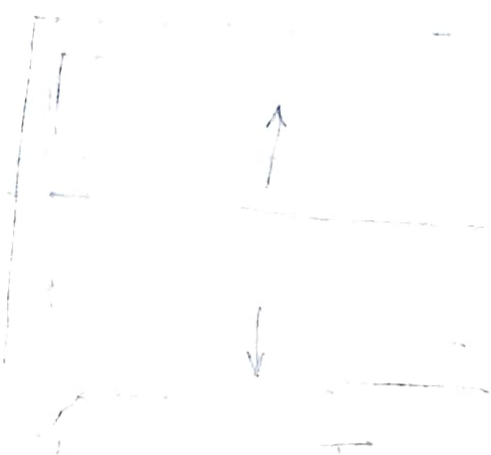


600mm + 150mm
or 225mm

* Put the foundation spread anywhere a wall is
* Dimension of roofs - put the dimension of the items beside it. e.g 50x50 purline
* Thicken out the ~~construction~~ main lines, and if time permits, clean off the construction lines.

Roof Plan





Architectural brief.

- Is it a bungalow or storey building?
- How many bedrooms
- What other features? Sitting room, library, etc. size laundry room. store e.t.c.
- En-Suite bedrooms (separate toilet & bath).

The brief can be given in the exam, then develop the building.

- Neatness
- Dimension

Drawn By	Architect.	Title: 1st Sem. Exams	Dimensions: millimm
Name:	name	Client: FUOYE	Scale 1:100
Mat. No.	address	Location: Ikole-Ekiti	
Sheet Number	email	checked by: Engr Fahyi	Slope of roof: 30°
Date	phone		

- Dimension / Length
- Neatness

CVE 302

Civil Engineering Drawing.

10/05/2021 **Course Outline**

* Drawing office practice
* Linear/Aligned dimensions
* Layout of drawings
* Building Layout orientations
* Building drawing standard format
* View of storey buildings, basement and details
* Reinforced concrete structural details

Drawing Office Practice

- Personel -
- Scope of Work
- Equipment

Drawing office functions as a support office for the field engineer, designer and architect.

- An Architect
- An engineer
- A draughtsman

Scope of work

- Drawing
- Approval work

Equipments

- Drawing Table
- Computer System
- Plotters
- GIS Equipments — ArcView

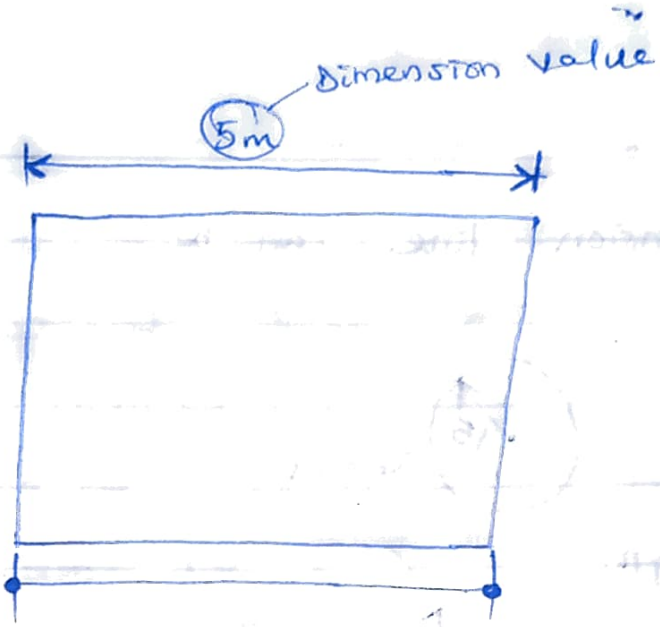
Softwares — CAD

Dimension

The dimension communicates reality about a drawing. A drawing is only an artistic work without dimensions

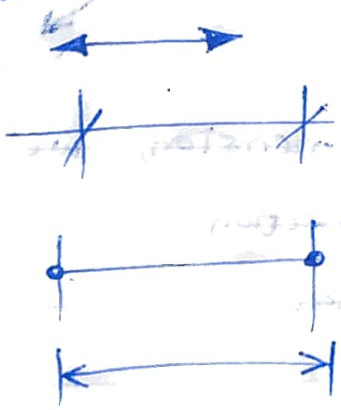
4 components of dimension

- Dimension value
- Dimension line
- Terminal / Arrow head
- Extension lines
- Leader line

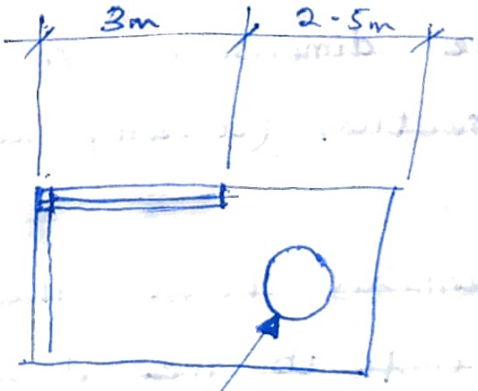


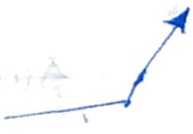
The dimension line shows the extent of a dimension

The terminal or arrow head



Extension line





Ø20 — Leader line points to a certain feature in the drawing

A dimension line can be

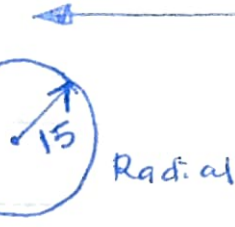
(i) Linear

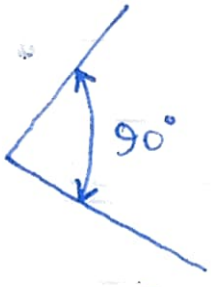
(ii) Radial

(iii) Angular

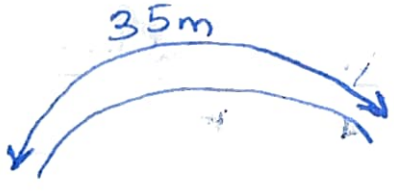
(iv) Arc length

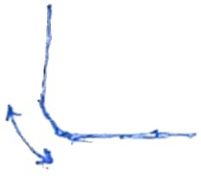
(v) Ordinate





The angular dimension line is mostly a curve.

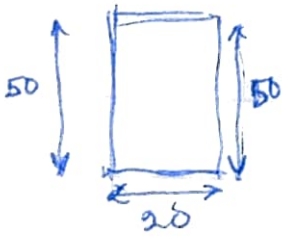




Under Linear dimension, we have

(i) Aligned direction

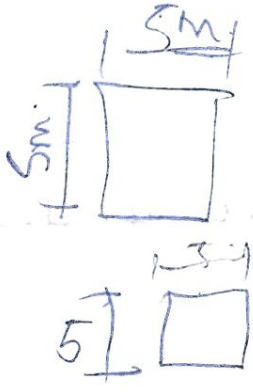
(ii) Unidirectional

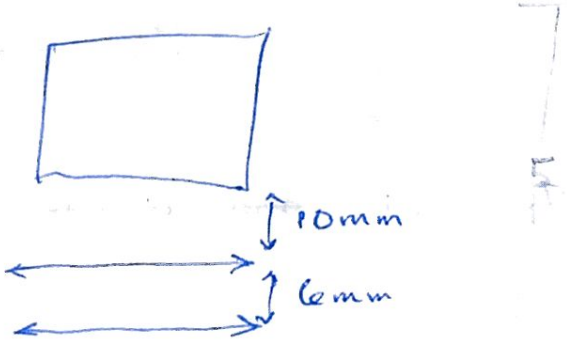


Unidirectional dimension is used in large drawings. The dimensions can only be read from one direction (usually horizontal position).

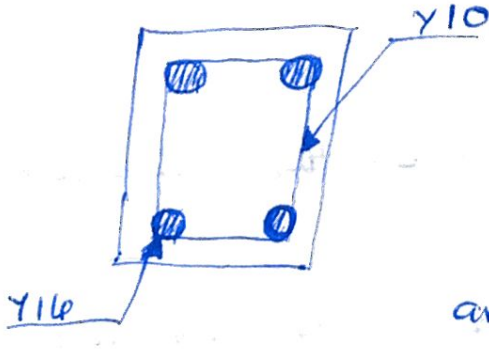
Aligned dimensions have their dimension lines aligned / parallel to the drawings, and can be read both vertically and horizontally.

- A dimension line must be readable
- It must be legible
- Good quality of dimension.
- It should be parallel to the feature, and should be at least 10mm away
- When using parallel dimension lines, they should be 6mm apart





- The extension line should not touch the drawing itself



The leader line must have a text that communicates information. The tip of the arrow must touch the feature/detail

High yield steel T, Y
Mild steel

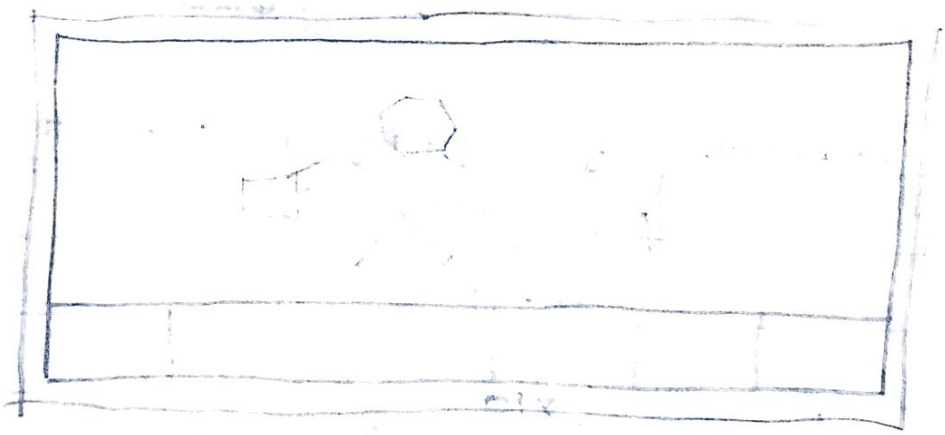
17/05/2021

Layout of Drawing

* Border line
* Title Block
* Drawing sheet

A0
A1 - 594 x 841
A2 - 420 x 594
A3 - 297 x 420
A4 - 297 x 210
A5

70 g wt and above - weight of drawing paper



- Consider the size of the drawing and drawing sheet
- Scale the drawing to fit into the drawing sheet.

- Architectural drawing
- Structural detailing
- M & E

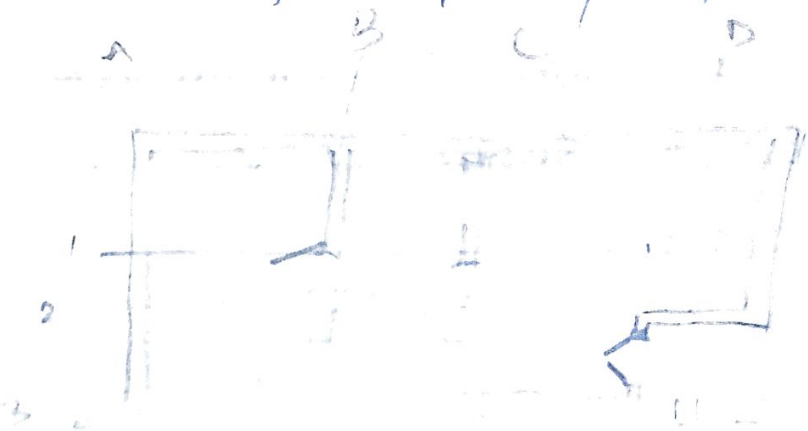
General Arrangement of drawing.

The roof plan does not come before the floor plan.

i. Floor plan
ii Working Drawing (Plan, Sections, Elevations) } 2D & other details
iii Mechanical/Electrical drawings (M & E)
iv Drawings about tunnels, machine parts e.t.c.
(based on the mechanical parts or type of equipment / information gotten from the mechanical engineer)
v Machine drawing
vi Bridges e.t.c.

Grid / Drawing grid.

It helps in pointing out the precise locations of aspects / components of the drawing.



Drawing grid is used both for structural and architectural drawing.

Column C1 is on grid B2

Building Layout Orientation

The orientation of a building is dependent on natural elements e.g Sunlight

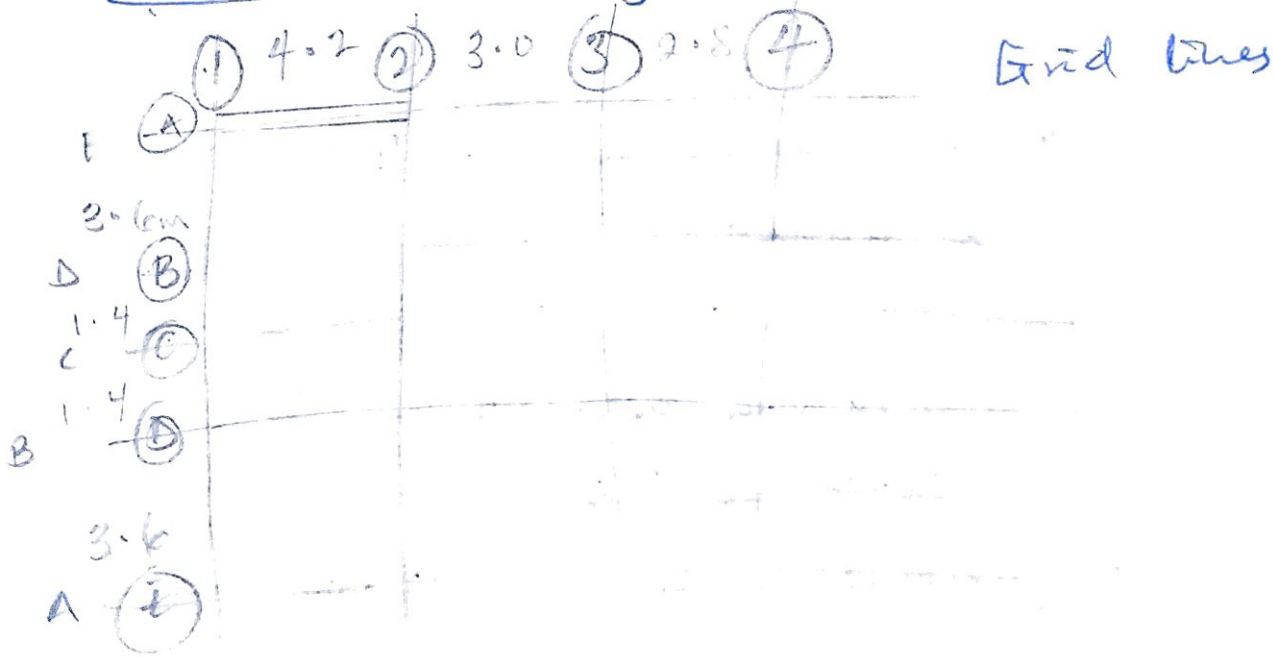
- Show the position of the true North
- The rainfall should also be considered.
- The Building line - The minimum distance a building can be to the centre of the road (50m for a national grid)
- Control lines - used for commercial buildings as a sort of setback e.g factories and industrial areas.

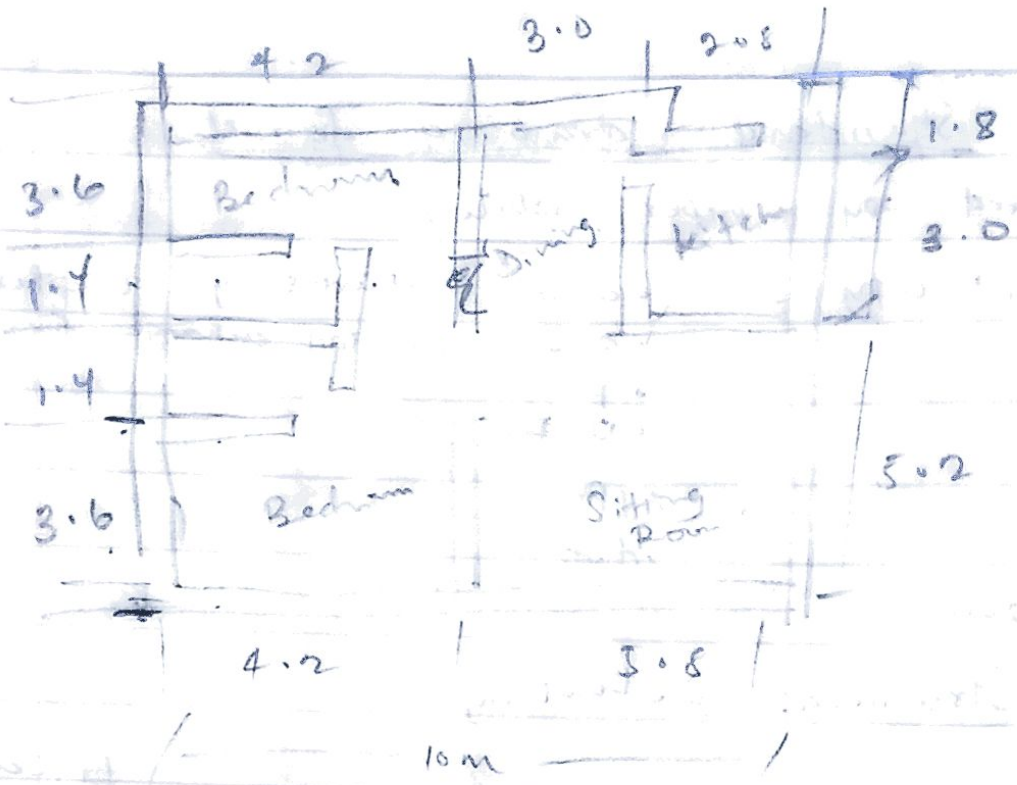
Standard drawing format

- Hard copy - paper (white).
- Soft copy — • dwg — universally acceptable
  • dxf - drawing exchange format.
  • pdf
  • png
  • jpeg
  • dwt

24/05/2021

Structural Detailing



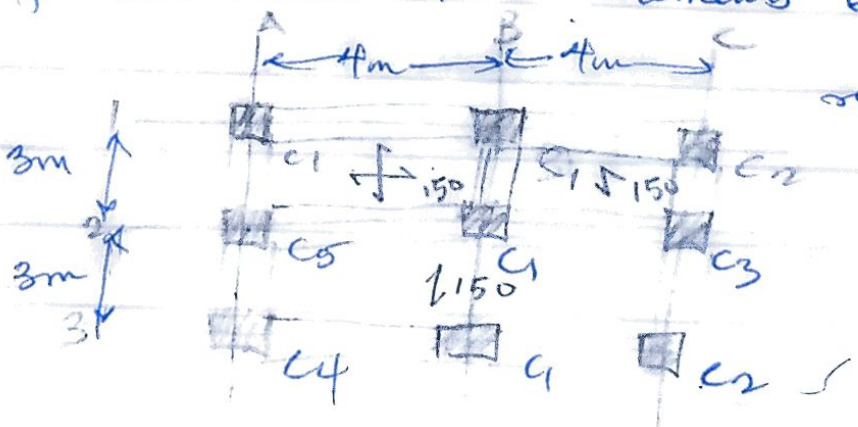


* All features not on the main grid will be added.

Structural detailing

- ~~Shows all the~~

(1) Structural drawing shows all the location and position of the structural elements e.g columns, beams etc as it relates to structures.

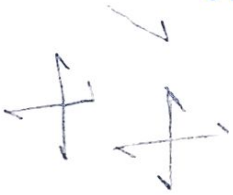


* Structural Drawing
* Reinforcement Drawing
* Standard Drawing.
* Record / Review Drawing

$C_1 = 4$ members
$C_2 = 2$
$C_3 = 1$
$C_4 = 1$
$C_5 = 1$

} 5 types of columns
9 columns in total.

Some grids may or may not have beams or columns or other structural elements



150 - The direction of the slab and the dimension

2 - way slab

Beams

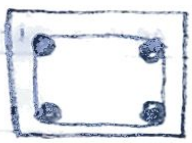
Column   Shaded / hatches.

Slab 

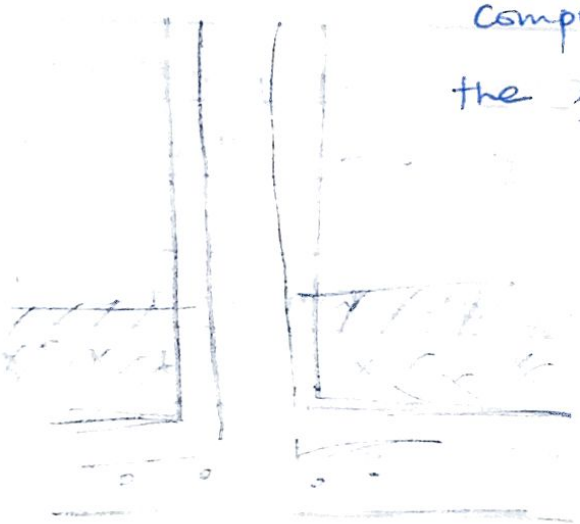
Other features on slabs may be shown eg staircase with opening

(2) Reinforcement drawing – tells us what is inside each component.

C1



The position of the reinforcement inside each component as it relates to the finished surface.



(3) Standard drawing talks about the standard notes. It discusses the assumptions guiding the design. It is always advisable to read the standard notes in a drawing before reading the drawing

The standard notes also talks about the exposure details e.g sunlight / water, e.t.c. fire exposure e.g 30 mins of fire.

④ Record/Review → [As Built]

The record/review is produced by the engineer. Some things might need to be changed/altered.

e.g 4 Y 20 ⇒ 6 Y 16 As built drawing

Reviews can be done after an initial design eg changes in the location of doors

As built drawing – at the end of a drawing

Review – In between drawings

[31-05-2024]

Structural drawing

① Grid

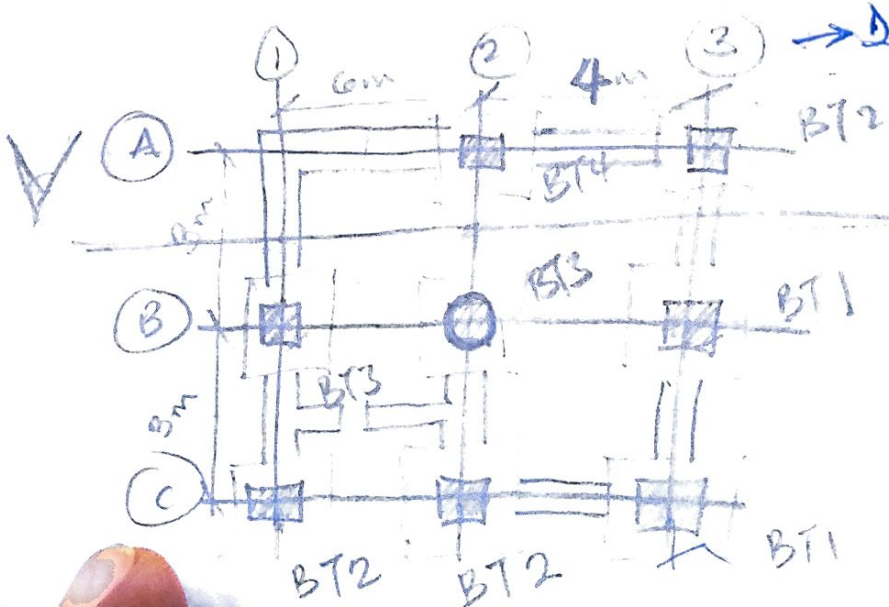
② Structural Elements

↳ Foundation

- Pad
- Strip
- Raft

[Pad foundation
Strip foundation

↳ Plan, Sections
→ Reinforcement position
→ Details



Base Type

* The normal foundation drawing shows the lines and the information being passed.
  - foundation type
  - strip
  - pad
  - columns, walls etc.

Columns → pad foundation

* Dimensions & labelling should move away from the main drawing itself).

* The dimension of the pad foundation will not be given, but the numbering can be given.

Group the base types

BT1 ⇒ 2

BT2 ⇒ 3

BT3 ⇒ 2

BT4 ⇒ 1

Pad foundation

Y6 Y8 Y10

1 : 100
1 : 50 ×2
1 : 25 ×5
1 : 10 ×10

4

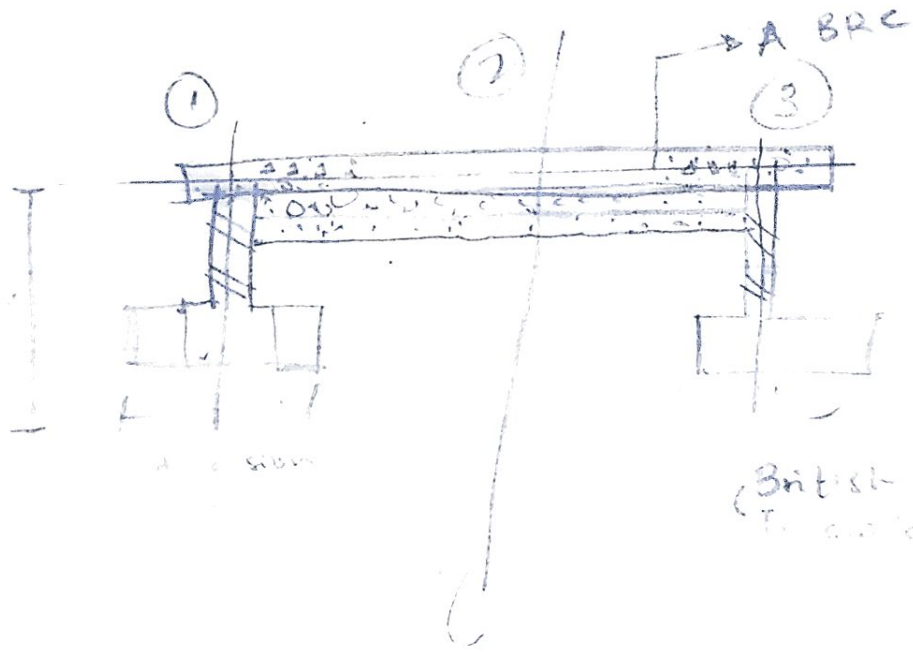
All places where there are walls will have strip foundation shown.

Strip foundation is 3× the dimension of the blocks.

If there are no walls, do not show strip foundation.

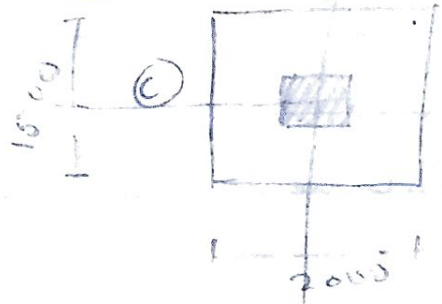
* Section of the foundation structure components
* Section across the foundation

(1)

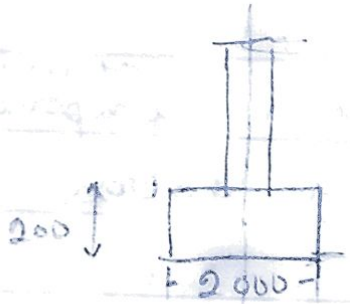


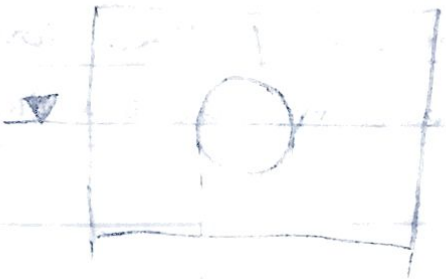
(2) Section that cuts across the foundation

- Show the plan for each base type
- Show the position of the column



* Show the grid line passing through the column.
* The design will determine the dimensions of the thickness / depth.

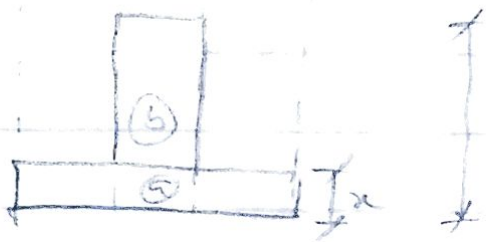


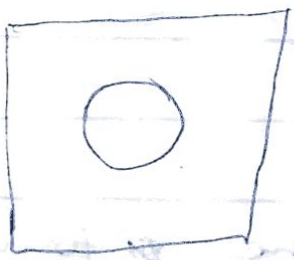


07-06-2021

Foundation

- Pad — Section
  — Plan.





Reinforcement

Show the reinforcement of the base and part of the column.

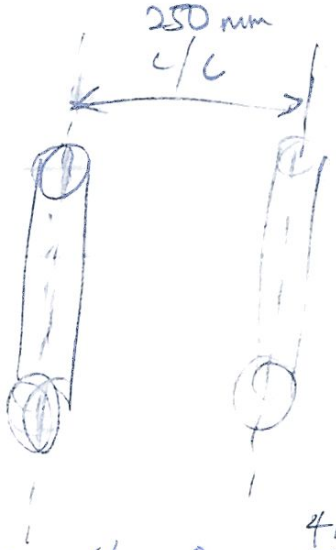
Show the reinforcement in plan and section

Slab (2-way) Y can also be written as T

(1) 3Y16 – 05 – 250

(2) 6R12 – 09 – 250

(3) 7Y12 – 11 – 200 T, B, F, N.



(1) Y – High yield steel

3Y – 3 high yield steel

(16) – Diameter of reinforcement

Strength of high yield steel – 460 N/mm² 410 380 390

(05) – Bar mark – To differentiate the different types of reinforcement bending.

(250) – Spacing 250mm c/c – centre to centre.

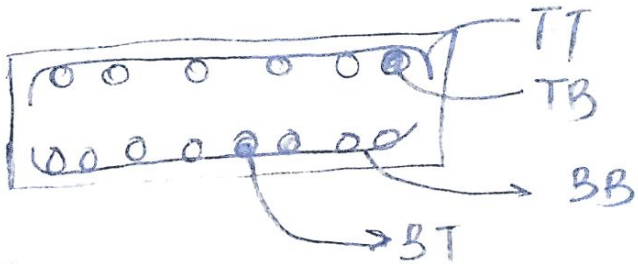
(2) R – Mild Steel. – has a lesser strength compared to high yield (250 N/mm²).

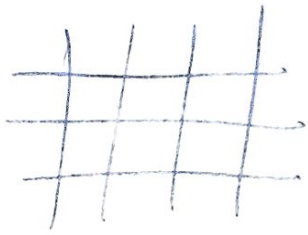
(3) 7 reinforcements, high yield, 12mm diameter

Slab (T) – Reinforcement at the top. (TT or TB)

(B) – Bottom reinforcement (BB or BT).

Section

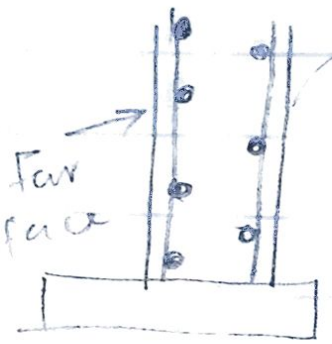




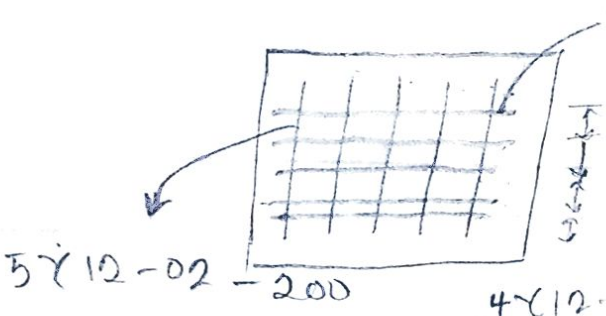
Plan

(F) – Far

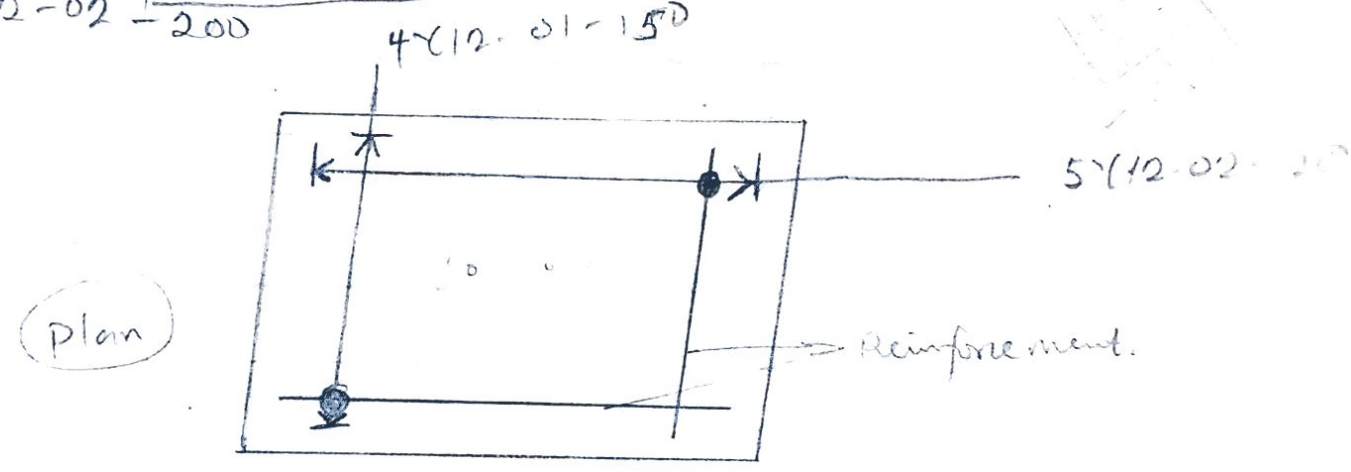
(N) – Near



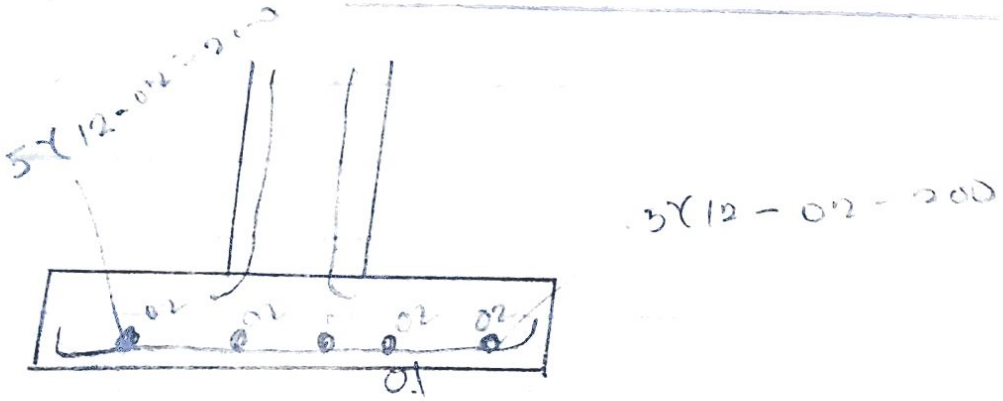
Concrete wall - for retaining wall, cantilever shaft e.t.c



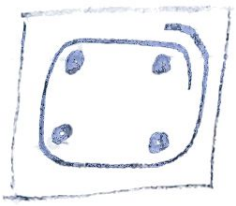
Plan + Reinforcement



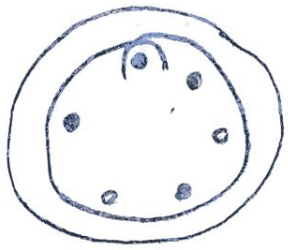
Reinforcement does not end with an arrow



16-05-2021



Circular column
six - rods

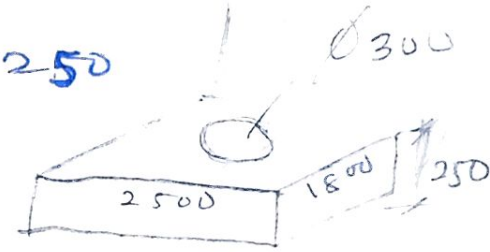


BT3 → Plan & Section

Dimensions – 2500 × 1800 × 250

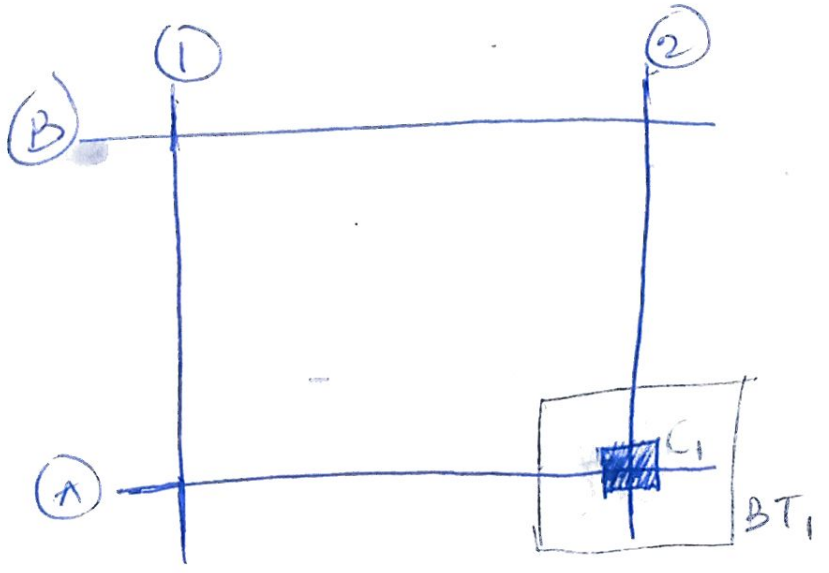
Scale – 1:50

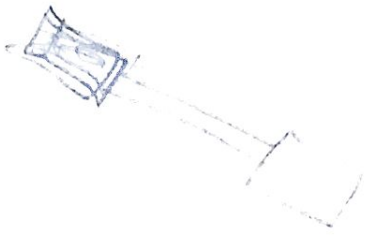
ϕ 300



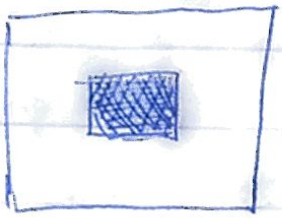
Foundation is 1200 from GL

21-06-2021

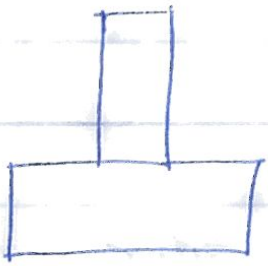


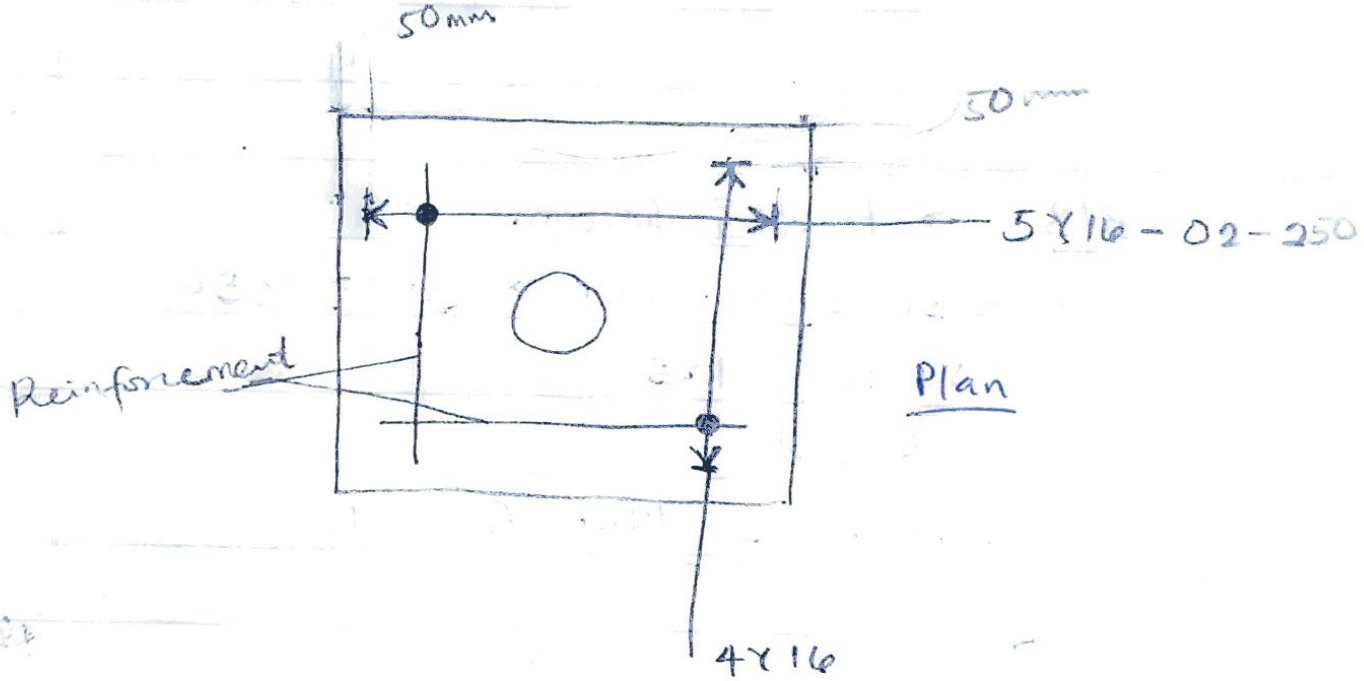


Plan



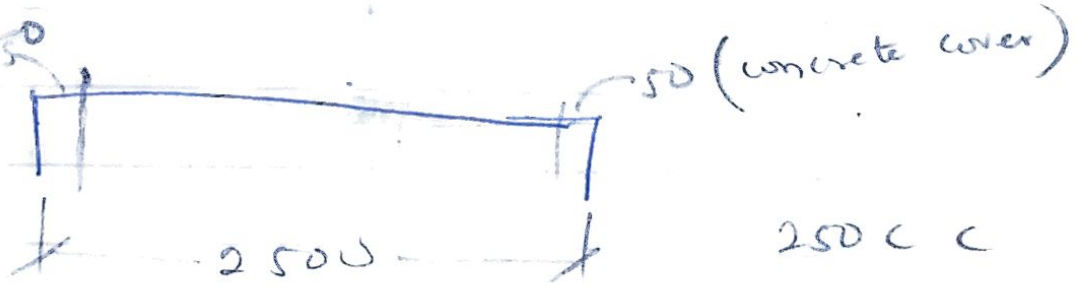
Section





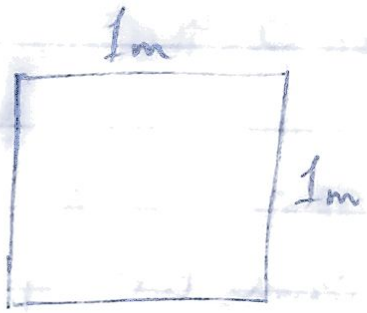
Foundation - 50mm

Column - 30mm



2400/250

1×10^3 = 1000 cm

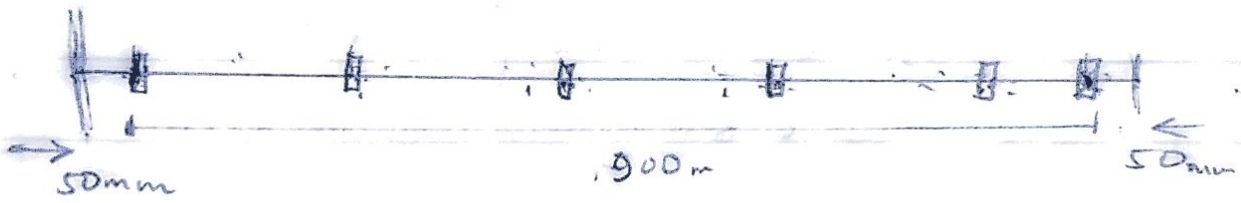


200 c/c

1000 − (50+50)

= 900

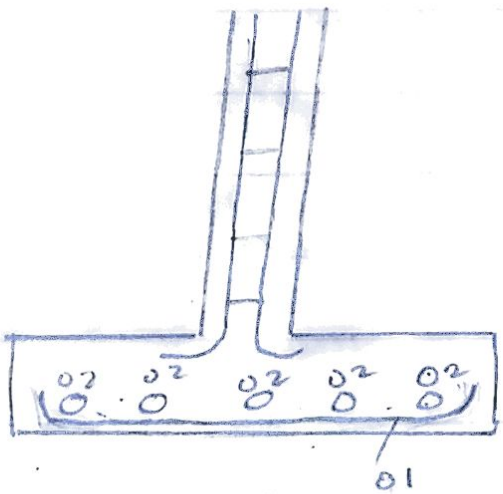
$\frac{900}{200} = 4.5$



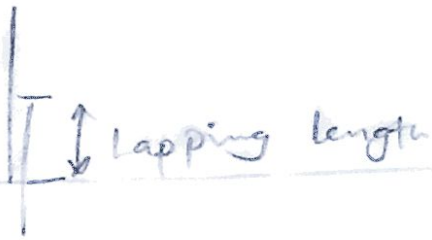
6 Rods

6Y16-02-200

Section



According to the specific spacing



Column

use largest diameter

Starter bars

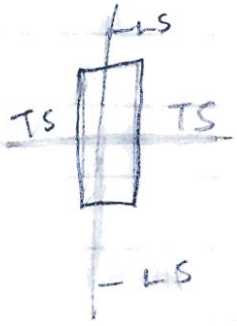
Lapping length – The diameter of the reinforcement is related to the lapping length.

How to calculate lapping length.

50 X diameter

50 X 16 = 800 mm = 0.8m } Y16

Show the vertical and horizontal section of the column.

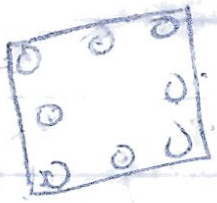


* A column 250 x 250 mm dimensions
* Concrete cover = 30mm
* Main reinforcement 8Y12
* Stirrup is Y10 @ 350mm c/c

Draw the details showing the transverse & longitudinal sections

Scale 1:~~10~~ ~~15~~ TS

1:50 longitudinal



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1. Types of drawings prepared by Structural Engineers

- Structural drawing. S R S R
- Reinforcement drawing.
- Standard Drawing.
- Record / Review (as built drawing).

(b) What are the four components of dimension line and name 5 types of dimension lines

Components of Dimension Line

(1) Dimension value
(2) Dimension line
(3) Terminal / Arrow head
(4) Extension Line
(5) Leader Line

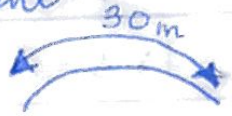
5 types of dimension lines

(1) Linear Measurement (straight)

(2) Radial Measurement (Arc)

(3) Angular Measurement

(4) Arc Length



(5) Ordinate measurement.

(c) What constitute a drawing office?

Personnel — (Architect, Engineer, Draughtsman)

Scope of Work — (*Drawing, *Approval work)

Equipment —

* Drawing Table
* Computer System
* Plotters
* GIS Equipment
* Softwares - CAD

(d) What is Aspect and Prospect in relation to building construction and Orientation

700

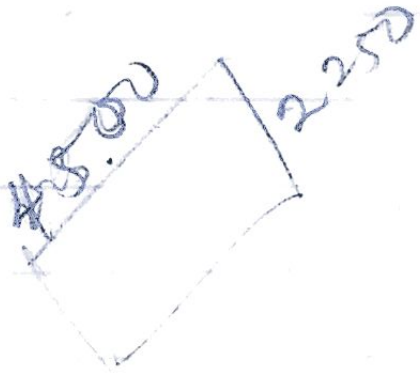
1200 × 1200 mm

Thickness of pad = 250 mm

column ϕ = 350 mm.

Longitudinal reinforcement - Y12@250 c/c

Transverse reinforcement Y12@300 c/c



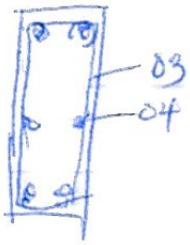
Base dimensions 1500 × 1500

Column size = 225 × 450

Reinforcement - 6Y20

Column height = 3m

Stirrup - Y10@300

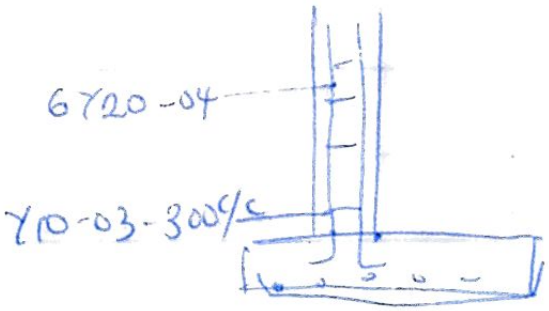


0

Square pad (1200 × 1200)

Thickness of pad = 250mm

Column = ϕ = 350



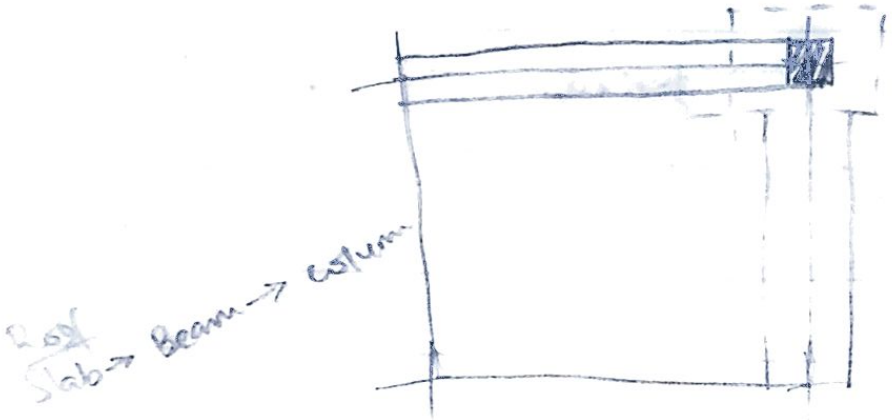
LS Y12@250 c/c

TS Y12@300 c/c.

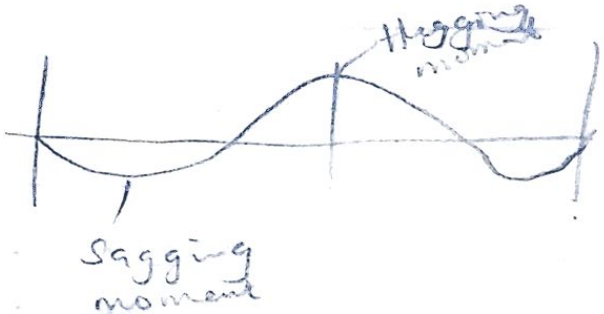
28-06-2021

Detailing of Beams

The beams are also on grids

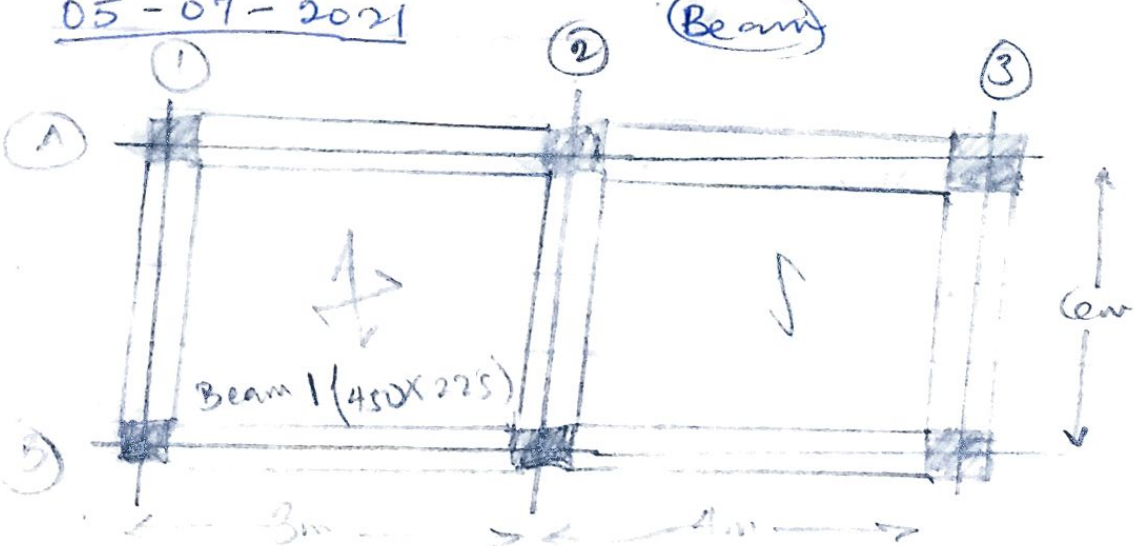


Reinforcement Sectioning

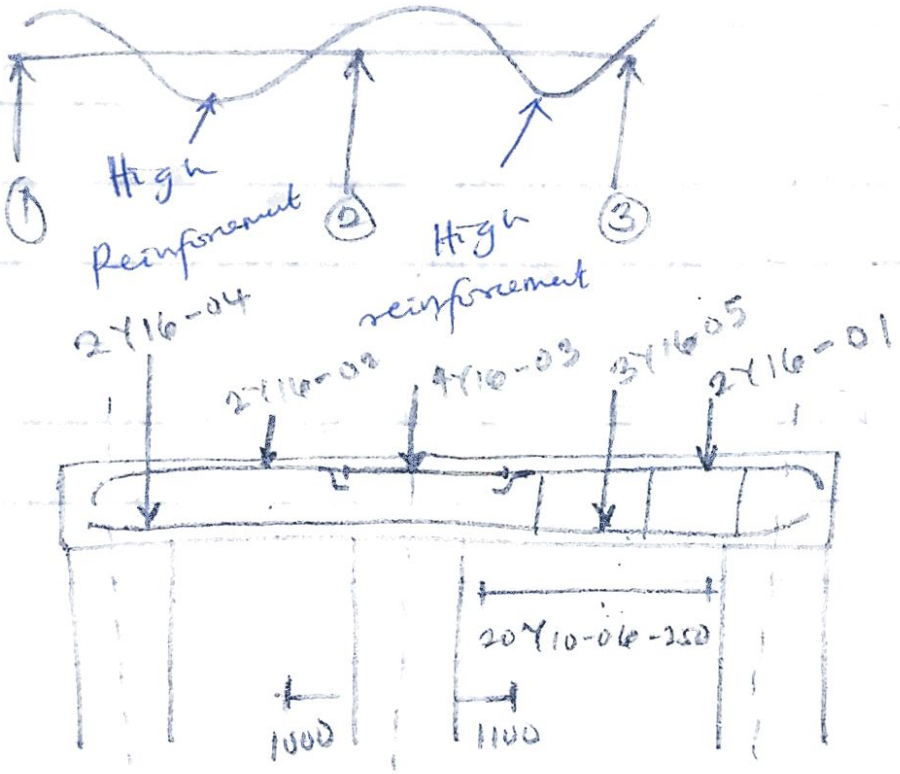


05-07-2021

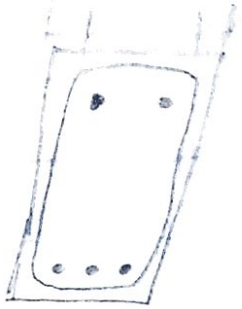
Beam



Beam Reinforcement

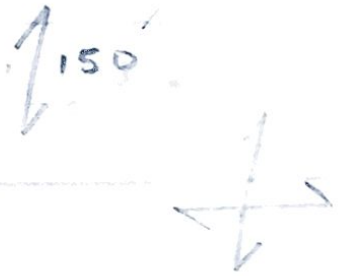


The main reinforcement and stirrup
The depth of the beam
Concrete cover
} determines the spacing in between the top and bottom reinforcement.



One way slab

Slabs



One-way slab

Two-way slab

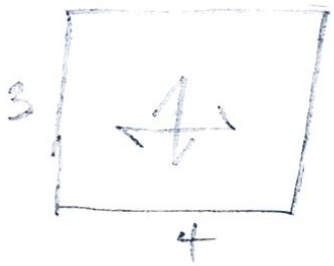
One-way slab

The main reinforcement along the shorter span. The distribution across the longer span

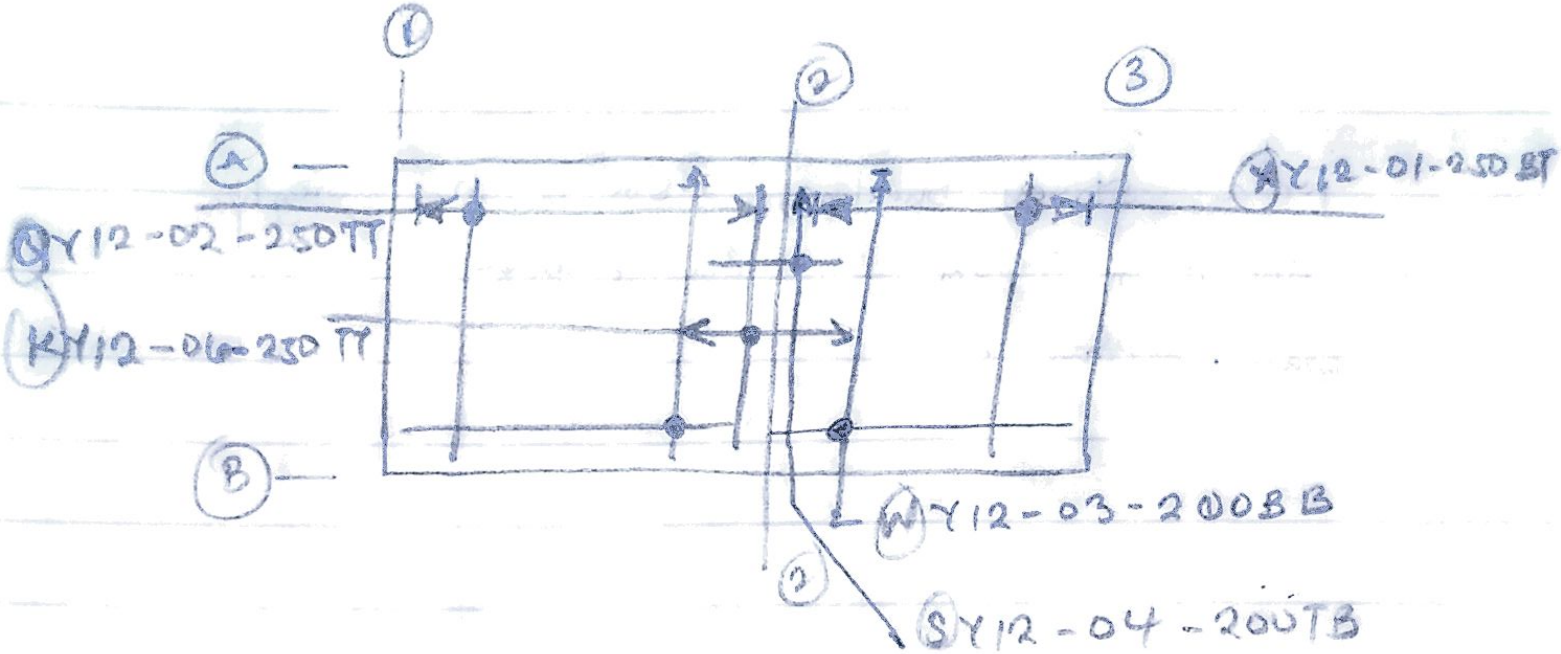
2-way slab

Equal ratio of Length — Breadth.

The main reinforcement and the distributions are equal

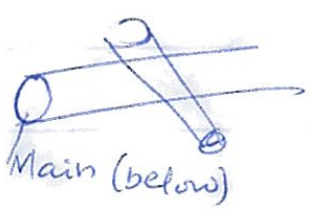


The main reinforcement does the major work, but the distribution can assist in load sharing.



where X, Y, S, Q K, W are numbers.

Main Reinforcement - down, distibutuon up



12-07-2021 Two or three - Storey Building

- Plan
- Elevations
- Sections.

Single storey - x2 of bungalow

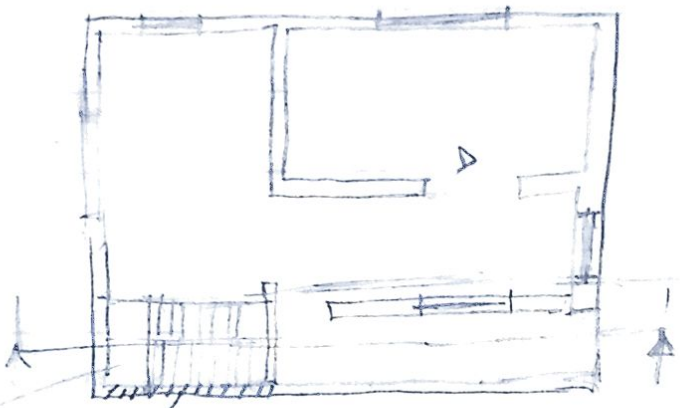
Slab thickness = 150mm.

Bungalow 2.5m

For a storey building, 2.8m is not enough.

3m, 3.1m 3.15m 3m → above

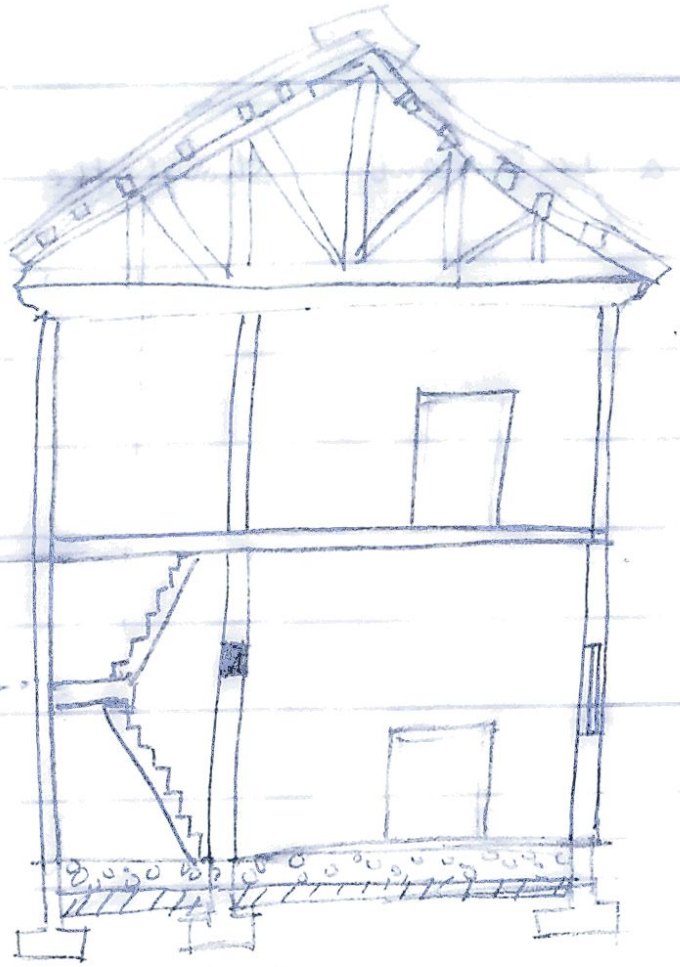
Exam - ~~Plan~~ .



Landing for staircase

Perforated brick for staircase wall

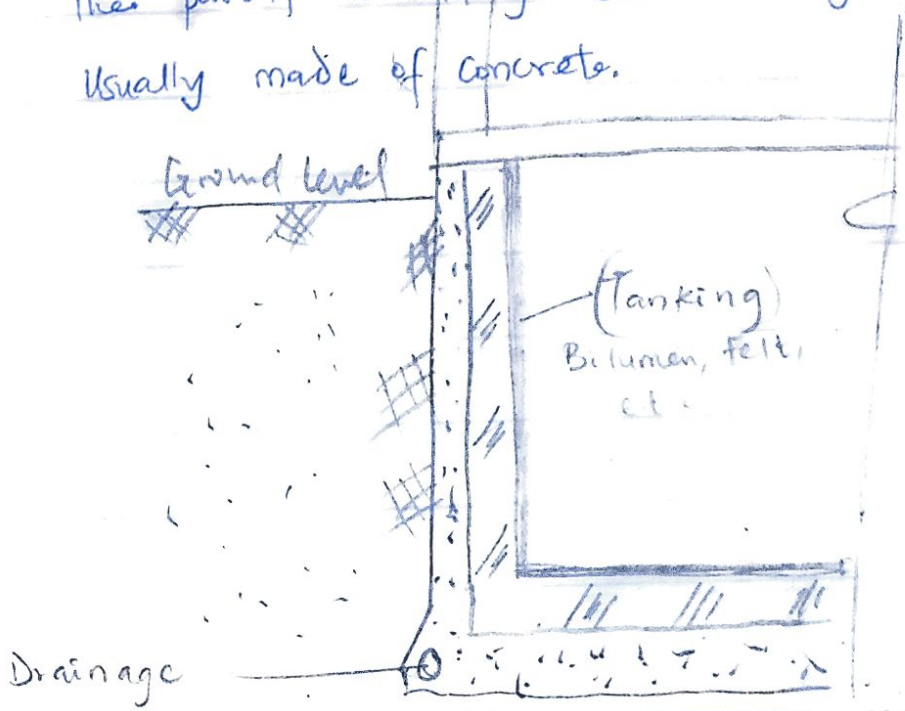
$\frac{3.1}{2} = 1.55$



* Landing – halfway between ground floor and top floor
* The landing is a slab of 150mm thickness.
* Show trusses in the section

Basements

The part of a building below the ground floor.
Usually made of concrete.



The section of a basemen

- Wall
- Drainage

4 Questions

- scale
- Dimensions
- Neatness