

**GOVERNMENT POLYTECHNIC
BHUBANESWAR**



**DEPARTMENT OF CIVIL ENGINEERING
LECTURE NOTE**

SEMESTER: 3RD

BATCH: 2024-27

SUBJECT CODE & NAME: TH1, BUILDING CONSTRUCTION

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Building Construction

Th-1

Classification of building as per National building code (NBC)

The building is defined as any structure for purpose and use material constructed and every part whether used as human or not includes

1. Foundations

2. Plinth

3. Wall

4. Floor

5. Roof

6. Plumbing etc

As per NBC of India building are classified in to 9 groups.

Group A - Residential building

Group B - Educational building

Group C - Institutional building

Group D - Assembly building

Group E - Business building

Group G - Industrial building

Group H - Storage building

Group I - Hazardous building

Group F - Mercantile building

Group A :- Residential building

The building which are provided with sleeping accommodation for normal residential purpose with or without cooking, dining both the facility except any building classified under group C.

Types of construction

According to structural system there are three types of building.

1. Load bearing Structure
2. Frame Structure
3. Composite Structure

1. Load bearing Structure

The system of building includes slabs, beams, and load bearing walls is known as load bearing structure.

- Most of the residential buildings are small in size and upto three storied are generally constructed as load bearing structures.
- The slab and floor are transmitted through walls to the soil below the ground in load bearing structure. Walls of the upper floor have less thickness than the walls of lower floor. Such types of structure are most suited for buildings upto three storied and where hard strata of soil is available.

2. Frame Structure

It is a structure includes slabs resting on beams which are supported by a network of column.

The live load from the slab is transport to the cross beams which in turn transfer it to the main beams through rigid joints.

- Main beams rest over columns and load from the beam is transferred to the soil through column and their footings.
- All the walls may or may not be a partition walls as none of them bear the load.

- All the wall rest on plinth beam and not provided with any Footing or Foundation.

Generally all multi storied building or highrise building are constructed as Frame Structure.

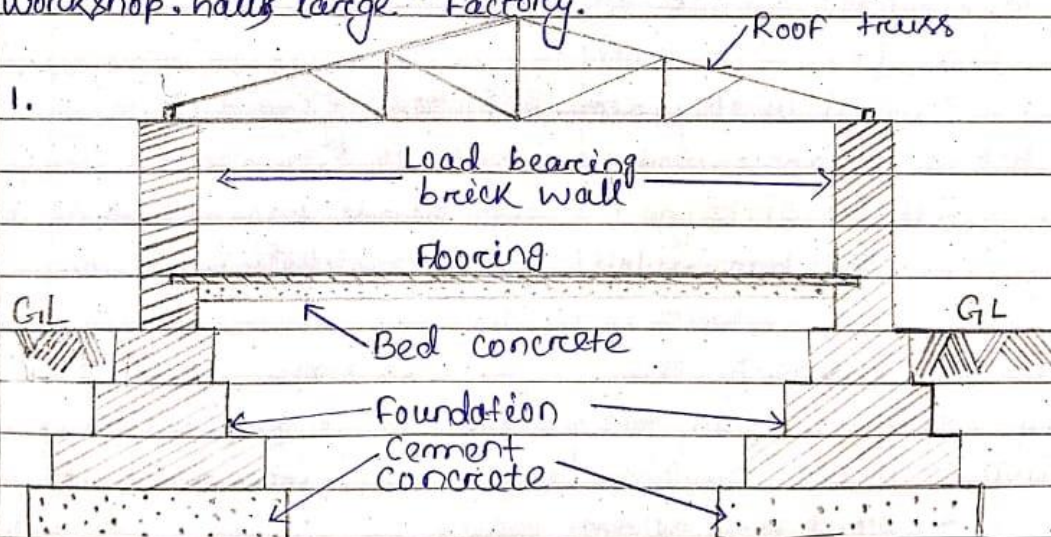
3 Composite Structure

Some of the building are constructed with combination of both load bearing as well as Frame Structure. Such structure is called composite Structure.

- In this type of Structure the external walls are treated as load bearing walls and all intermediate supports are in the form of Reinforced concrete Structure (RCC) Columns.

- Composite structure have advantages of both load bearing as well as Frame Structure.

- The composite Structure are preferred for the building having large span (length) such as workshop, hall, large factory.



Load bearing Structure

Comparison of Load bearing Structure with Framed Structure

NO	Load bearing Structure	Framed Structure
1.	Almost all the walls are load bearing walls.	All the walls are partition walls or screen walls. None of the wall is load bearing.
2.	Almost all the walls are provided with shallow or deep foundations.	All the walls rest on plinth beams and not provided with any footing or foundations.
3.	All load bearing walls are taken deep into the subsoil for foundation.	Only columns are taken deep into the subsoil and are provided with footings.
4.	Load bearing walls are constructed of bricks & stones.	Columns, beams and slabs are constructed of R.C.C.
5.	Thickness of load bearing walls in any case is not less than 200mm.	Only exterior walls are of thickness 200mm & all interior wall are of thickness 100mm or less.
6.	A load bearing wall when once constructed shall remain in position and should never be dismantled.	The walls of framed structure can be shifted at any place as they are lighter and not load bearing.
7.	Too many openings for doors, windows, ventilators etc. are not permissible.	There is no such restriction in framed structure. The space bet ⁿ two column can be kept fully or partially open as per planning & requirements.

8. Plans, for different floor

8. & remain same as every wall on the upper floors must be a corresponding wall in continuation of wall of lower floor

Planning for each floor

is independent and free whatever the planning of lower floor

9. It requires soil at good bearing capacity like rocks, sandy soil, gravelly soil etc.

Even in the case of soil with poor bearing capacity, piles may be driven until hard stratum is reached & RCC columns are constructed over them

10. Best suited for small residential houses, rural houses and houses up to three story

Best suited for multistoried and high rise buildings, commercial complexes, public buildings, etc.

The buildings are divided in 3 parts:-

1. Foundation
2. Plinth
3. Super structure

} Sub Structure

1. Foundation

Foundation is also known as substructure of the building. It is the most critical part of the building which transport the entire load of the building to the sub soil in which it rest in such a way that the settlement of the soil doesn't fall in shear cuplift pressure.

Foundation of a building should be design as most of the failure are probably due to faulti design. Various types of foundation and

their Purpose are to be converted by foundations.

2. Plinth

A part of Sub Structure located betⁿ the ground level & the Floor level is known as Plinth.

The height of the Plinth depends upon elevation, ground level, highest flood level etc.

Usually plinth beam & DPC (Damp Proof course) are provided at the top of the plinth.

3. Super Structure

(i) Wall:- walls are used to enclose or divide the floor space.

Load bearing walls should be strong enough to take its own weight, super imposed weight and lateral pressure of wind.

They should provide stability weather resistance, fire resistance, heat insulation and sound insulation.

(ii) Floor:- A Floor provides support to the occupant; Furniture & equipment of a building.

Different Floor divide the building into different level to provide more accommodation on a given plot of land.

The Floor of a building immediately above the ground is known as ground floor.

The Floor below the ground level is known as basement floor or lower level floor.

(iii) Sill and Lintel:- Window sill are provided betⁿ the bottom of the window frame and above the top of the wall below.

The lintel is provided above the opening of the windows, doors and ventilators in the wall

Foundation.

Beam:-

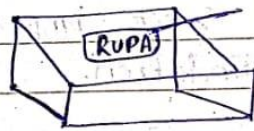
Beam is a horizontal structural elements design to support and transfer loads from wall, roof, floor to vertical support like column and foundation.

* Shallow Foundation:- Depth less (Strong Soil property)

* Deep Foundation:- Depth more (Weak Soil property)

Lintel:-

A concrete work upon window of door. (It will resist the wall load and will not affect the door and window)



Frog (Joint)

- Manufacture Name

- Cement paste will be better
Frog helps in less weight of brick

Roof = Slab

Dismantling - Separation of Material

Parapet wall - Boundary wall

Q. What is function of Foundation or substructure?

Ans. The function of foundation of a building is to transfer its total load acting on the super structure to the subsoils without excess in settlement of the subsoil.

Load carry

1. Slab

2. Column

3. Beam

4. Plinth

5. Foundation

6. Footing

7. Subsoil

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Unit - 2 Construction of Substructure

Foundation

* Function:-

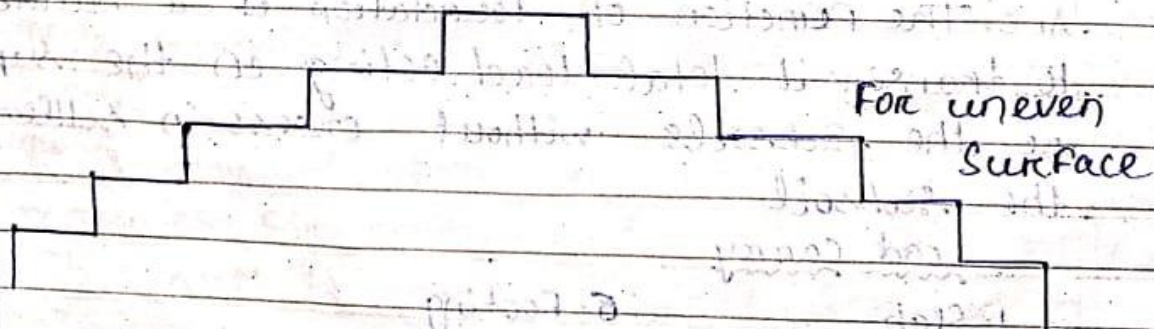
1. To support the Structure.
2. To distribute the total load coming on the Structure.
3. To give enough lateral stability (bearing capacity) to the Structure from wind, rain, earth quake.
4. To prepare a level for concreting and masonry (brick or rock work) work.
5. To provide the structural safety against - animals flooding.
6. To prevent or minimize cracks due to movement of moisture in case of weak soil.
7. To prevent or min
7. To transmit the super impose load (live load) on case of deep foundation.

Types:-

a. Shallow Foundation - A shallow Foundation transfers a structural weight to the ground near the surface with its width more than depth.

Stepped Footings:-

They are specialised Foundations constructed in steps, allowing for a stable base.



- This foundation controls a large number of openings on ground floor for construction.

RCC -

PCC -

→ Grillage Foundation:-

In this method the depth is limited to 1m to 1.5m and the width is increased considerably the super structure rest on two perpendicular tiers.

- The concrete filling doesn't carry any load but maintains the beam in proper position.

- The steel grillage foundation are useful for structure having concentrated load like factories, towers, theatres.

Depth Foundation:-

(a) Pile Foundation:-

It is used to transmit the load of structure to the soil in case of wall or pier.

Use:-

- It is suitable for very heavy load and soil of uneven surface.

- It is more effective as compared to grillage or raft foundation.

- This is adopted for the structure in the area where drainage channel water logs area are present.

- It is necessary where the soil is affected by scouring nature (Soil erosion) of water.

- Pile foundation may be designed to give lateral support or to resist uplift pressure.

Wall Footings (For weak soil):-

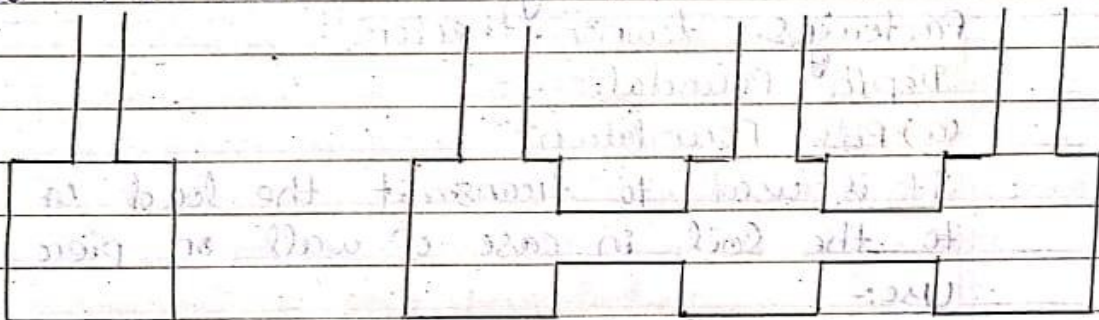
It is also known as strip footing or continuous footing. It spreads its weight over a large area of soil preventing excess settlement.

Column Footings:-

A column footing is a square or rectangular base that supports a column, distributing the load to prevent settlement & ensure stability.

Isolated & Combined column footing:-

Isolated footing support individual column where as combined footings support two or more than two in a row.



Isolated

Combined

Raft Foundation:-

This type of foundation is useful where the load coming on the soil is practically uniform (soil condition is soft clay) the method consist of providing a RCC slab of suitable thickness necessary reinforcement. This type of foundation is suitable for weak soils, heavy structure, closely spaced column and high water-table (basement).

Foundation.

Beam:-

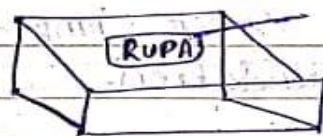
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Load carry

- | | |
|---------------|------------|
| 1. Slab | 6. Footing |
| 2. Column | 7. Subsoil |
| 3. Beam | |
| 4. Plinth | |
| 5. Foundation | |

Types:-

(i) Load bearing Pile:-

This pile bearing the load coming from the structure. It may resist the load by directly resting on stratum or by Friction.
(Soil Surface)

(ii) Non-load bearing Pile:-

This pile doesn't support the bearing of load directly in contact with structure. Such piles are known as sheet pile and used for.

- * To protect the river bank
- * To widen the sides of foundation.
- * To isolate foundation from nearby soil
- * To prevent under ground water movement.
- * To construct retaining wall.
- * To increase bearing capacity.

The materials use for sheet pile are concrete sheet pile, steel sheet pile, timber sheet pile.

Advantages of pile foundation:-

- (i) High loadbearing capacity
- (ii) Suitable for weak soil.
- (iii) corrosion resistance
- (iv) Reduces settlement. (Soil stabilization)
- (v) handle water logged sites.

Disadvantage of pile foundation:-

- * High cost
- * complex design and installation
- * Noise pollution
- * difficult to modify
- * least and environmental issues.

Well foundation :-

- This is also known as caisson and is a type deep foundation that transverse heavy load through unstable soil to stable one.
- It is commonly use for large brick and monumental structure.
- It involves sinking of large, hollow concrete structure in to the ground and then filling it with concrete.
- Well foundation is effective in water borne environment, to resist against lateral force, scour and floating debris efficiently than pile foundation.

Cofferdam :-

A cofferdam is defined as a temporary structure which is constructed so as to remove water or soil from a construction area.

Requirement :-

- (i) It is generally constructed at site of work.
- (ii) Large area for construction can be enclosed.
- (iii) It resist the force of water along with other destructive forces.
- (iv) It exhibits the absolute water tightness at desired situation.

Use :-

- To facilitate pile driving, operation.
- To place grillage foundation / Raft Foundation
- To construct foundations for pier and

abutment to enclosed a space for removal of water to provide a working platform for foundation.

Type:

- Single wall cofferdam.
- double wall cofferdam.
- Concrete cofferdam.
- Suspended cofferdam.

Pumping method of dewatering:

- Sum Pumping: collecting ~~sand~~ pit and pumping pit out and suitable and shallow dewatering low permeable soil.

Well Point System:

Use small diameter wells in a line to create a vacuum.

3) Deep well:

Use large diameter boreholes.

4) Chalelling:

Involves excavating ditch around the site to collect ground water which is then pumped out.

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Amal
21/09/25