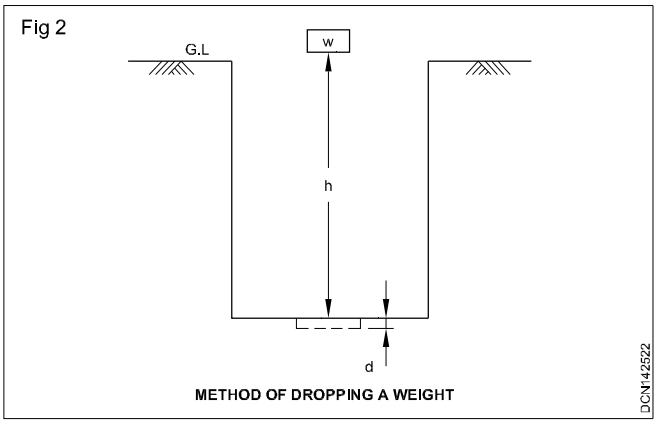
Method of dropping a weight

In this method a substance of known -weight is dropped

Method of dropping a weight

Fig 2



METHOD OF DROPPING A WEIGHT

In this method a substance of known -weight is dropped from a known-height as shown in figure. The depth of impression made by the weight on the soil is noted.

Then the bearing capacity of soil is worked out as follow:

If, R= resistance of soil

w= Weight of the substance

h= height

d= depth of impression

Total energy = wh=Rxd

$$R = \frac{wh}{d}$$

ie, R= ultimate bearing capacity of soil

if A= Cross sectional area of the substance

$\frac{R}{A}$ = Resistance of soil per unit area.

$$\text{Bearing capacity} = \frac{R}{A}$$

$$\text{safe bearing capacity} = \frac{R}{AxF}$$

Where F= factor of safety.

The results obtained by this method are approximate and hence this method is used for minor engineering structure.

Method of improving bearing capacity

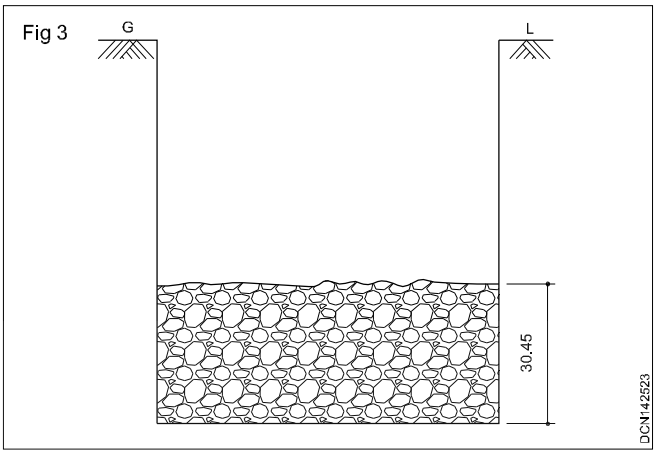
Increasing depth of foundation

It has been found that in granular soil the bearing capacity increase with the depth due to the confining weight of overlying material. It is not economical since the cost of construction increases with the increase in depth. This method is useful when bearing straturm is met at greater depth.

Compacting soil

In this method the width of foundation is increased by about 45cm or 50 and a layer of 30cm - 45cm of rubble is spread over the bottom of the foundation as shown in (Fig 3). This layer of rubble is well rammed. If the material is buried completely, another layer of depth about 15-25cm is laid and it is well rammed. At the end of this process, if the bearing capacity of soil is tested, it is found to have increased considerably. This increasing bearing capacity of soil may then be used for the design purpose.

Fig 3



Drainage of soil

It is a well known fact that the presence of water decreases bearing power of soil. This is because of less shearing strength of soil in presence of excess water. Drainage results in decrease in voids ratios and improvement of bearing power.

Confining the soil (sheet piling):-

The movement of soil under the action of load can be prevented by confining the ground by use of sheet piles. This will results in the increasing of bearing power of soil.

Grouting

Bore holes in sufficient number are driven in the ground the cement grout is then forced under pressure through these bore holes. The cracks or fissures of the rocks are these filled up, resulting in the increase of bearing power of soil.

Chemical Treatment

In this treatment certain chemicals are used in place of cement grout to solidify the soil. But as this process is costly it is adopted only in case of important building.

CAUSES OF FAILURE OF FOUNDATION AND MEASURES TO PREVENT SUCH FAILURE

The unequal settlement of sub soil may be due to

- Unequal distribution of load on foundation.
- Varying bearing power of subsoil.
- Eccentricity of the load

Due to unequal settlement of the subsoil, cracks are formed in the building. This failure can be prevented by

- Foundation should be rest on rock or hard moorum.
- Proper design of the base of footing. So that it can be resist cracking.
- Avoiding eccentric loading

Unequal settlement of masonry

Mortar joint may shrink and compress which may lead to unequal settlement of the masonry.

This failure can be prevented

- Using mortar of proper strength.
- Using thin mortar joint.
- The height of wall to be raised per day should be limited to 1m in lime mortar and 1.5m in cement mortar.
- Properly watering the masonry.

Withdrawal of moisture from the sub soil

This occurs at places where there is considerable variation in the height of water table. When water table falls the soil particles loose cohesion and hence, there is shrinkage of soil, resulting in the cracks to the building. To prevent such failure,drive piles upto the hard rocks.

Lateral pressure on the super structure

The thrust on a pitched roof or arch action, or wind action on the super structure causes wall to overturn.

To prevent such failure, provide a sufficient wide base and to design the foundation for the worst condition.

Horizontal movement of the earth

Very soft soil is liable to give away under the action of load, especially as places such as sloping ground, river banks etc. Hence in such cases it is desirable to construct retaining walls or to drive a sheet piles to prevent the escape of earth.

Transpiration of trees and shurbs

The roots of trees planted near a building may extent upto the foundataion level and may absorb the moisture. This effect is seen in the form of a depression on the ground, and it may lead to crack in the building. To prevent such failure.

- The foundation should be taken sufficiently deep at a minimum depth of 1m is required for this purpose.
- The trees should not be planted near the building with a distance of 8m.

Atmospheric action

Rain and sun are the main atmospheric agents to seriously effect the foundation of a building. Heavy rain or considerable variation in temperature or thrust action may damage the foundation. If the water remains stagnant near the foundation it will remain constantly damp resulting in the decrease in strength of footing or foundation wall. Hence it is always recommended to provide suitable wind protection along the external wall by

- Filling back the foundation trenches with good soil and compacting it.
- Providing a gentle ground slope away from the wall.
- Suitable underground drains should be provided to maintain water table at definite level.

Foundation

Objectives : At the end of this lesson, you shall be able to,

- **define foundation**
- **state types of foundation**
- **explain purpose of foundation**
- **explain various loads on foundation**
- **describe causes of failure of foundation and its remedies.**

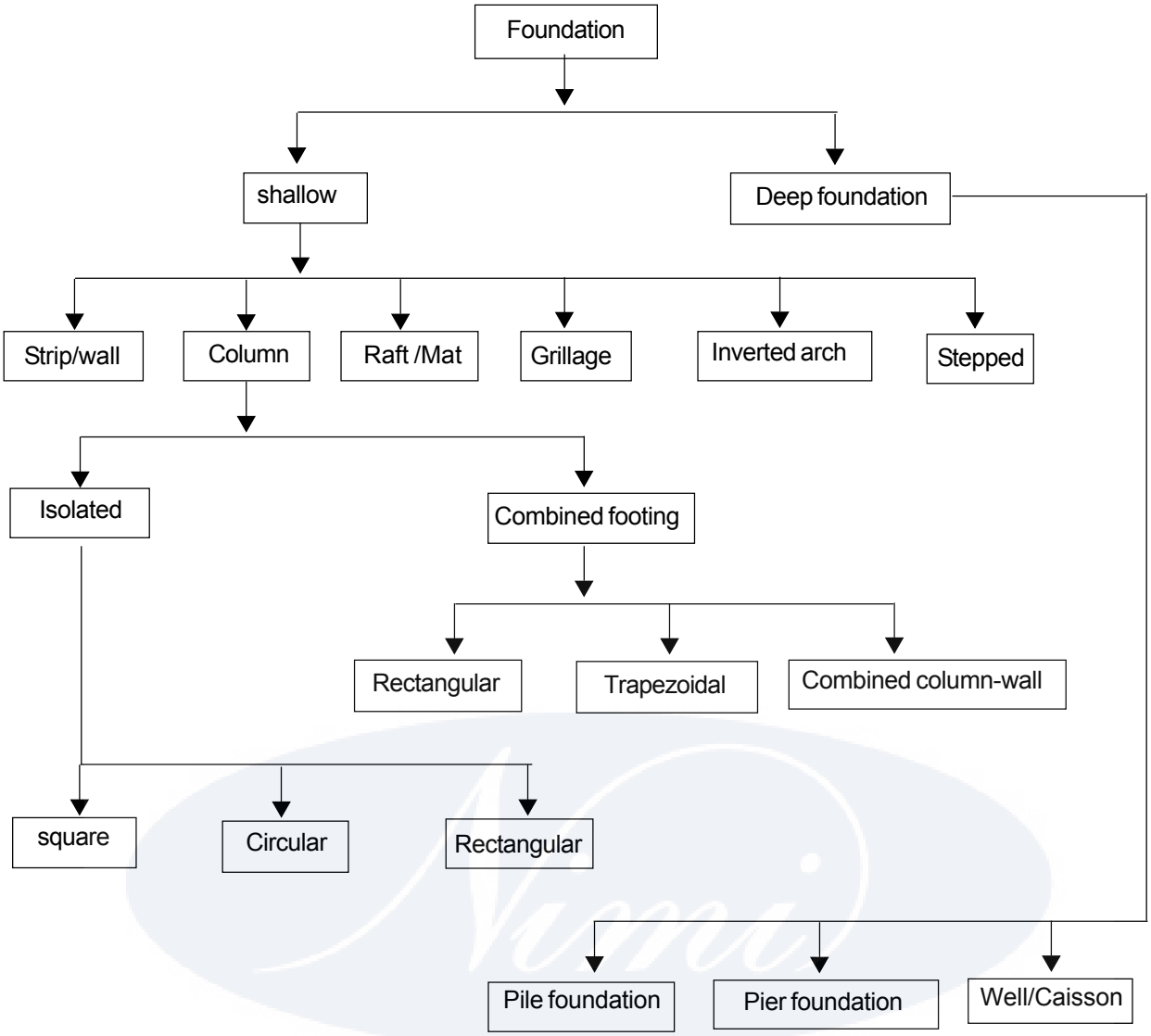
Introduction

Every structure consists of two parts, namely foundation and super structure. Foundation is the lowest part of a structure which transmits the weight of the structure, together with the effect of live loads and pressure, to the material on which the structure rests in such a manner that the underlying material is not stressed beyond its safe bearing capacity.

Definition

The lowest artificially prepared part of the structure, usually located below the ground level, which transmit the load of the superstructure to the ground is known as substructure or foundation.

Types of foundations



Types of loads

1 Dead load 2 Live load 3 Wind load 4 Snow load

Causes of failure of foundations and its remedies

Causes	Remedies
1 Unequal settlement of the subsoil	Foundation should rest on rigid strata. Design of foundations should be appropriate to the nature of subsoil.
2 Unequal settlement of the masonry	Using mortar of proper strength. Masonry work should be raised evenly. Proper Curing.
3 Withdrawal of moisture from the subsoil	Provide drive piles up to the hard rock.
4 Lateral pressure on the superstructure	Provide sufficient wide base.
5 Horizontal movement of the earth	Construct retaining walls to prevent the escape of earth.
6 Transpiration of trees and shrubs	Foundations should be sufficiently deep. Trees should not be planted near the building.
7 Atmospheric action	Provide suitable underground drains. Providing gentle ground slope away from the wall.