



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



## **DEPARTMENT OF CIVIL ENGINEERING**

### **19 GET102-BASIC CIVIL AND MECHANICAL ENGINEERING**

**I YEAR ISEM**

**UNIT 2 – BUILDING COMPONENTS**

**Topic 1 :FOUNDATIONS AND TYPES**





# Sub Structure



- The substructure is the part of the building that is built below the ground level whereas superstructure is the part of the structure that is constructed above the ground level.
- The substructure is the lower part of a building which is constructed below the ground level.
- The function of substructure is the transfer of loads from the superstructure to the underlying soil.
- So, the substructure is in direct contact with supporting soil. Substructure involves footing and plinth of a building.



# Foundation



- Foundation is the lowest portion of a structure which transfers the load into the supporting soil.
- The main purpose of the foundation is to distribute the total weight of the superstructure over a large area of soil.
- Various types of foundations are described below which are used in construction.



# Purpose of Foundation



- To distribute the load of the structure on a bigger area so that the intensity of load does not exceed the safe bearing capacity of the underneath soil.
- To distribute the load on underneath soil uniformly and thus to prevent unequal settlement of the foundation.
- To provide a leveled and hard surface for the super-structure to be built over it.
- To increase the stability of the structure against sliding, overturning, or any other forces like wind, rains, etc.
- To prevent lateral movement of the supporting material to ensure the safety of the structure is not at risk.



# Reason for Above structure failure.....??



**Foundation failure**



# FOUNDATION

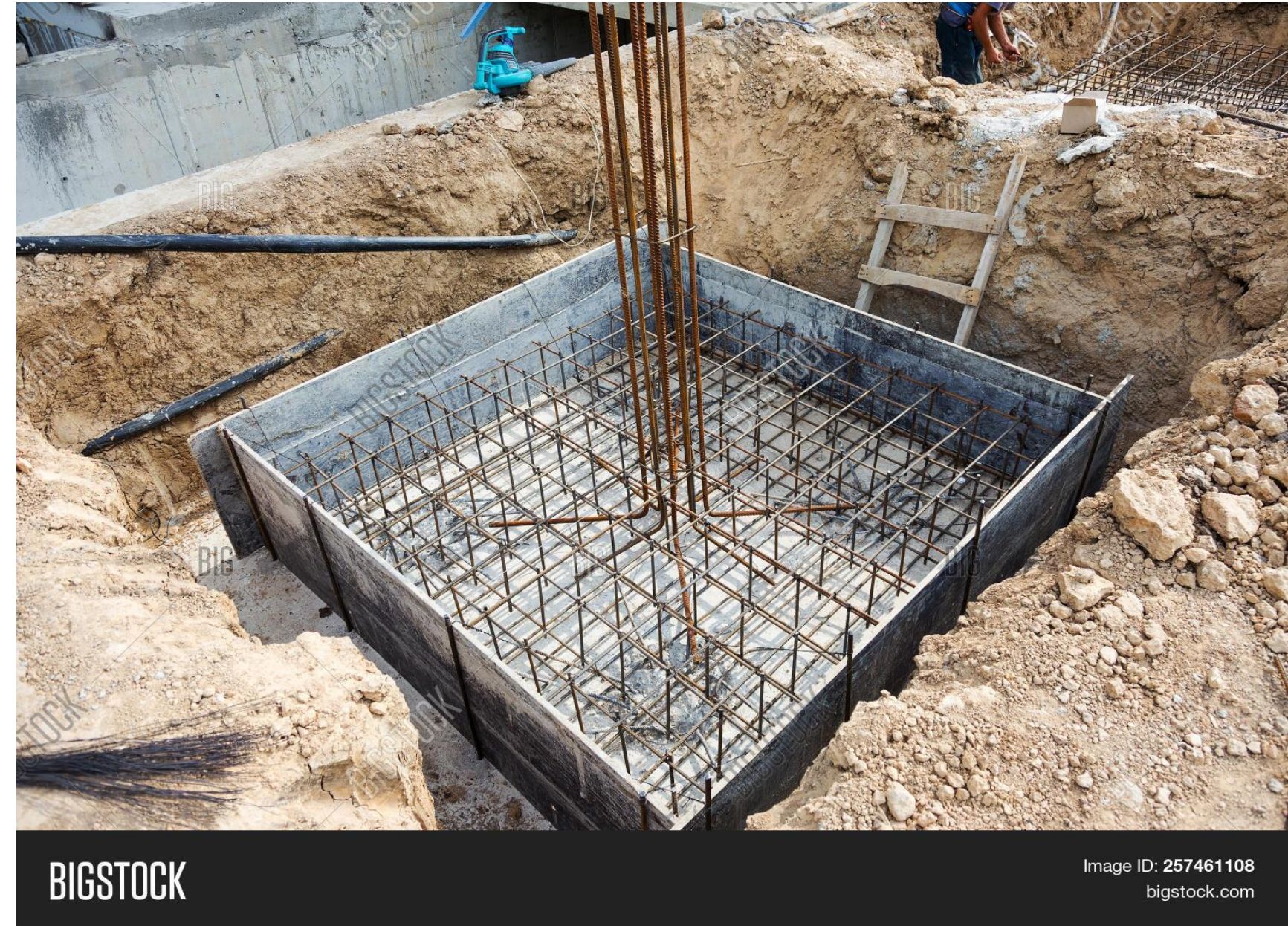


## Definition:

Foundation is the lowest part of the building or the civil structure that is in direct contact with the soil which transfers loads from the structure to the soil safely.

## Functions Of Foundation:

- ❖ Provide overall lateral stability for the structure
- ❖ Foundation serve the function of providing a level surface for the construction of substructure
- ❖ Load Distribution is carried out evenly
- ❖ The load intensity is reduced to be within the safe bearing capacity of the soil
- ❖ The soil movement effect is resisted and prevented
- ❖ Scouring and the undermining issues are solved by the construction of foundation





# TYPES OF FOUNDATION

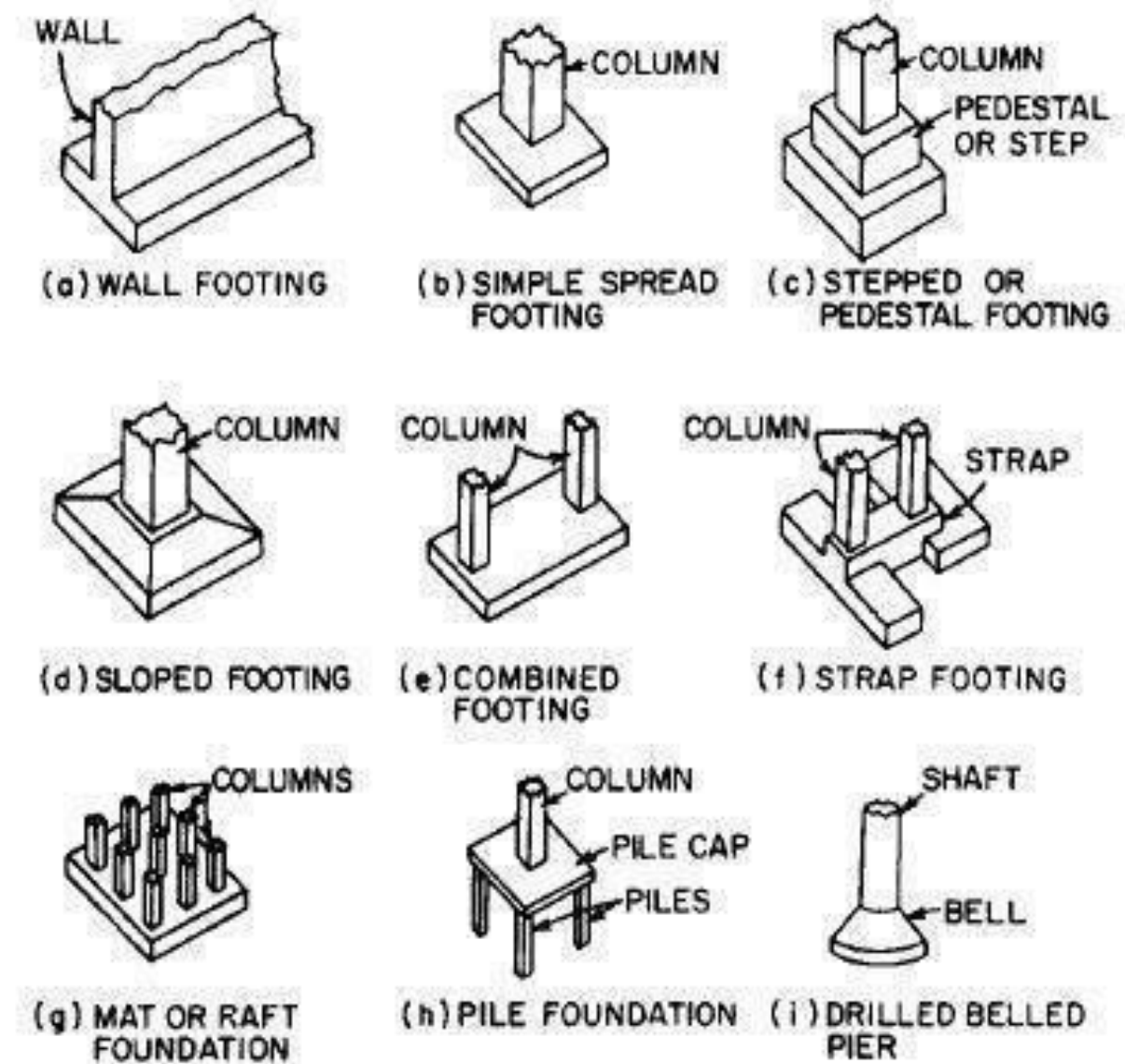
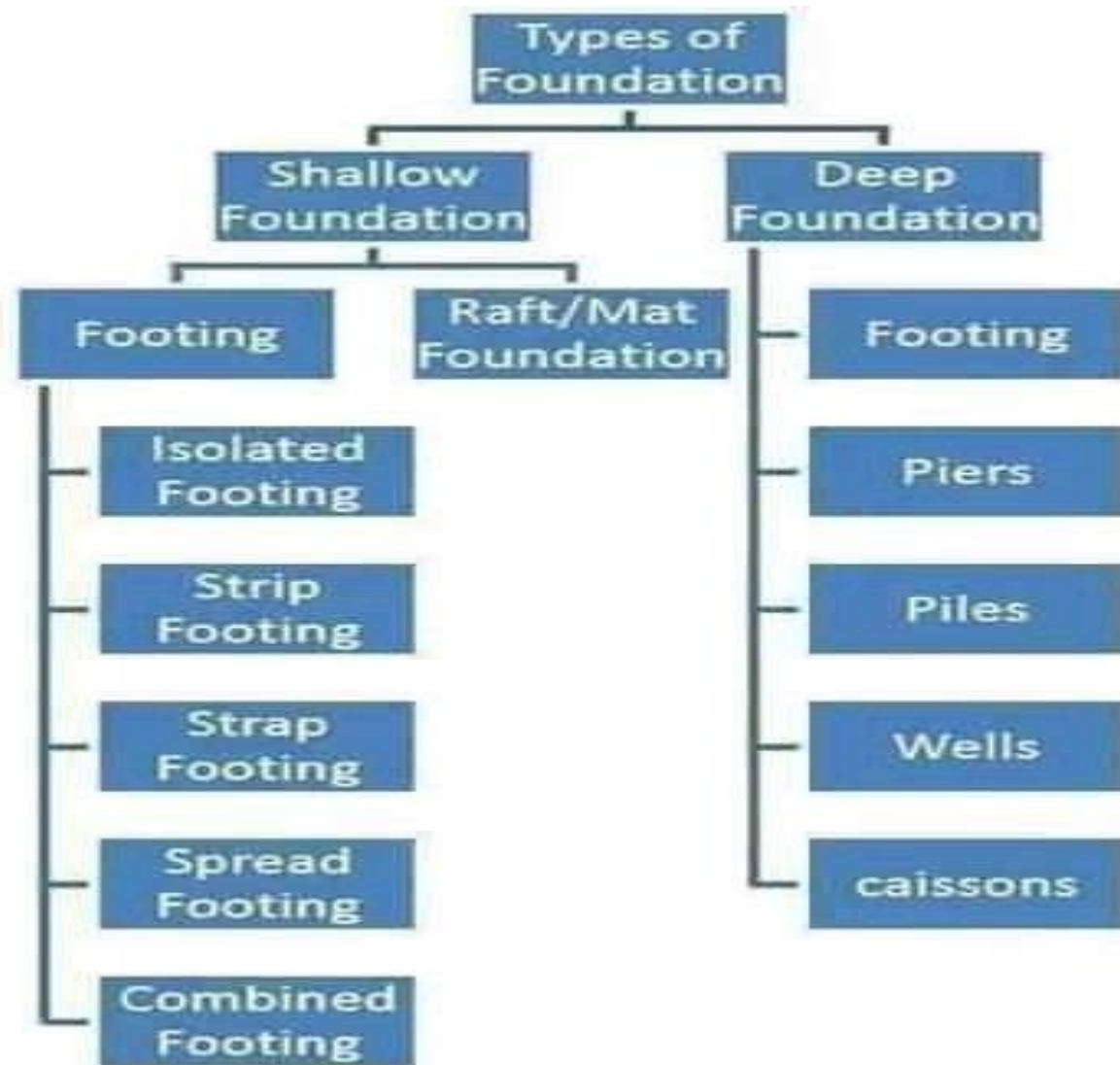


FIGURE 9.41 Common types of foundations for buildings.





# Bearing Capacity



- The bearing capacity of soil is defined as the capacity of the soil to bear the loads coming from the foundation. The pressure which the soil can easily withstand against load is called allowable bearing pressure.
- When excavating for a foundation, the stress at founding level is relieved by the removal of the weight of soil. The net bearing pressure ( $q_n$ ) is the increase in stress on the soil.
  - $q_n = q - q_0$
  - $q_0 = g D$
- where  $D$  is the founding depth and  $g$  is the unit weight of the soil removed.



# Types of Bearing Capacity



- Following are some types of bearing capacity of soil:
- 1. Ultimate bearing capacity ( $q_u$ )
- The gross pressure at the base of the foundation at which soil fails is called ultimate bearing capacity.
- 2. Net ultimate bearing capacity ( $q_{nu}$ )
- By neglecting the overburden pressure from ultimate bearing capacity we will get net ultimate bearing capacity.

$$q_{nu} = q_u - \gamma D_f$$

- Where  $\gamma$  = unit weight of soil,  $D_f$  = depth of foundation



# Types of Bearing Capacity



- 3. Net safe bearing capacity ( $q_{ns}$ )
- By considering only shear failure, net ultimate bearing capacity is divided by certain factor of safety will give the net safe bearing capacity.
  - $q_{ns} = q_{nu} / F$
- Where  $F =$  factor of safety  $= 3$  (usual value)
- 4. Gross safe bearing capacity ( $q_s$ )
- When ultimate bearing capacity is divided by factor of safety it will give gross safe bearing capacity.

- $q_s = q_u / F$



# Requirements of Good Foundation



- ✓ The foundations shall be constructed to sustain the dead and imposed loads and to transmit these to the sub-soil in such a way that pressure on it will not cause settlement which would impair the stability of the building or adjoining structures.
- ✓ Foundation base should be rigid so that differential settlements are minimized, Specially for the case when super-imposed loads are not evenly distributed.
- ✓ Foundations should be taken sufficiently deep to guard the building against damage or distress caused by swelling or shrinkage of the sub-soil.
- ✓ Foundations should be so located that its performance may not be affected due to any unexpected future influence.
- ✓ Foundations should be such that it can easily carry dead load and imposed load of the structure and transfer the loads to the soil.



# Requirements of Good Foundation



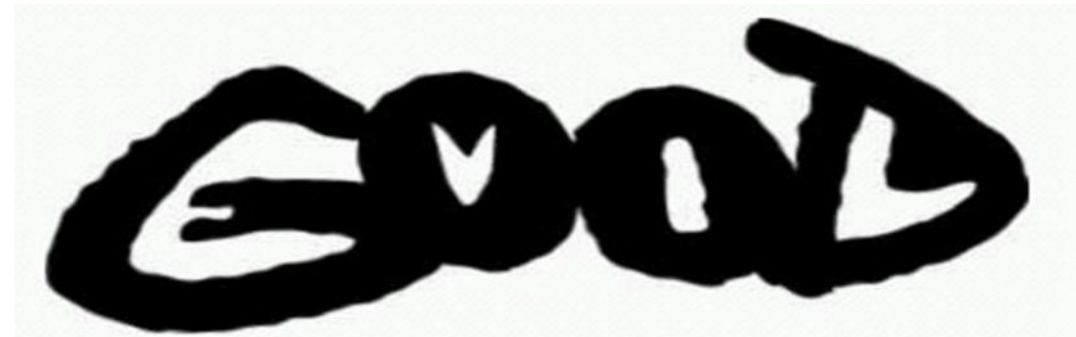
- ✓ Foundation base should be strong enough to reduce the unequal settlement of soil if imposed load is not distributed equally to the soil.
- ✓ It should have a definite depth so that structure may not be damaged due to expansion or compression of soil volume beneath the foundation.
- ✓ Foundation should be strong and designed with safety factor so that structure may not be damaged due to unexpected effects.



# QUESTION TIME –ICE BREAKAR



What do you see?



In black you can read the word GOOD, in white the word EVIL (inside each black letter is a white letter).

It's all very physiological too, because it visualizes the concept that good can't exist without evil (or the absence of good is evil)



# CAUSES OF FOUNDATION FAILURE IN BUILDINGS



- ❖ Unequal settlement of sub-soil
- ❖ Unequal settlement of masonry
- ❖ Withdrawal of sub-soil moisture below the foundations
- ❖ Lateral pressure on the super-structure









# ACTIVITY TIME -TRICKY IAS INTERVIEW QUESTIONS AND ANSWERS



**Bay Of Bengal sea in which  
state...**

In the liquid STATE.  
This is a hypothetical IAS  
interview question so without  
confusion candidates should  
give the answer for these types  
of questions.

