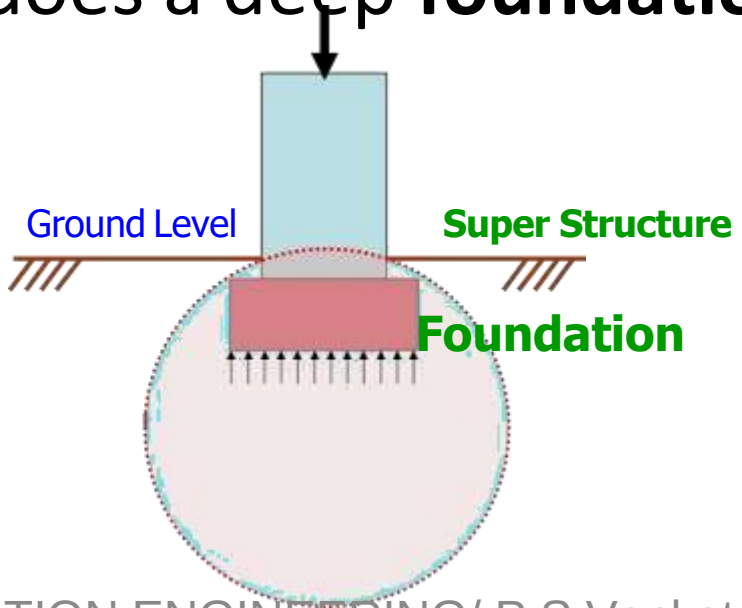
UNIT 2

SHALLOW FOUNDATION

A **shallow foundation** is a type of building **foundation** that transfers building loads to the earth very near to the surface, rather than to a subsurface layer or a range of depths as does a deep **foundation**.



SHALLOW FOUNDATION

$$\frac{D}{B} \leq 1$$

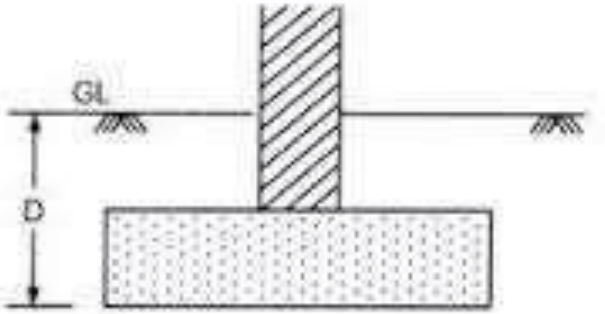


FIG. 11.2 Shallow foundation

- **Ultimate Bearing Capacity (q_f) : is the maximum pressure that a foundation soil can withstand without undergoing shear failure.**
- **Net ultimate Bearing Capacity (q_n) : It is the maximum extra pressure (in addition to initial overburden pressure) that a foundation soil can withstand without undergoing shear failure**

- **Safe Bearing Capacity (q_s) : It is the safe extra load the foundation soil is subjected to in addition to initial overburden pressure**

$$q_s = \frac{q_n}{F} + q_o$$

- **Allowable Bearing Pressure (q_a)**

  It is the maximum pressure the foundation soil is subjected to considering both shear failure and settlement

Shallow foundation	Deep foundation
The ratio of depth of embedment to width of foundation does not exceed 1	D/B>15 or L/D >15
Load is transferred to the soil which lies immediately below the foundation.	Partly by skin friction and partly by point load
They are constructed in open excavation in visible manner	Installed in the interior of earth unaided by visible inspection
Extent of soil disturbance is limited to very small zone	Larger zone of soil is affected extending over entire length

Foundation location and depth

- Location –should not affect future expansion, and should not be affected by construction of adjoining structures

- Depth of foundation depends upon sub soil strata , type of soil, size of structure, magnitude of loads, and environmental conditions

Location and depth of Foundation

The following considerations are necessary for deciding the location and depth of foundation

As per IS:1904-1986, minimum depth of foundation shall be 0.50m.

Foundation shall be placed below the zone of

- The frost heave
- Excessive volume change due to moisture variation (usually exists within 1.5 to 3.5 m depth of soil from the top surface)
- Topsoil or organic material
- Peat and Muck
- Unconsolidated material such as waste dump

- Foundations adjacent to flowing water (flood water, rivers, etc.) shall be protected against scouring. The following steps to be taken for design in such conditions Determine foundation type

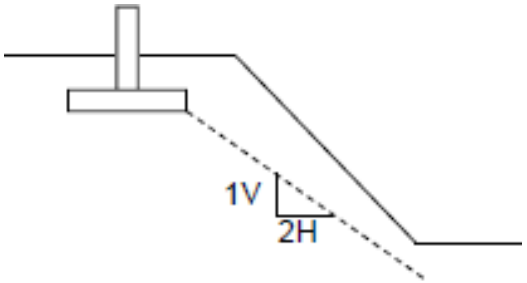
- Estimate cost of foundation for normal and various scour conditions

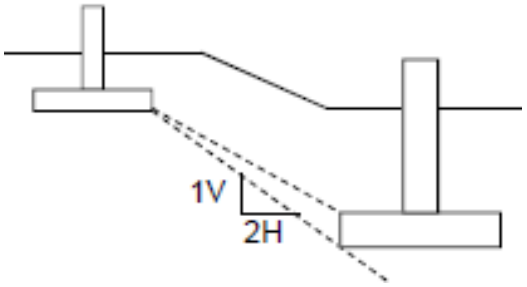
- Determine the scour versus risk, and revise the design accordingly

IS:1904-1986

For foundations adjacent to slopes and existing structures

- When the ground surface slopes downward adjacent to footing, the sloping surface should not cut the line of distribution of the load 2H:1V.
- In granular soils, the line joining the lower adjacent edges of upper and lower footings shall not have a slope steeper than 2H:1V
- In clayey soil, the line joining the lower adjacent edge of the upper footing and the upper adjacent edge of the lower footing should not be steeper than 2H:1V





Bearing capacity

- **Ultimate Bearing capacity: q_u**

Maximum gross intensity of loading that the soil can support against shear failure is called ultimate bearing capacity.

- **Net Ultimate Bearing Capacity: q_{nu}**

Maximum net intensity of loading that the soil can support at the level of foundation.

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

- **Net Safe Bearing capacity: q_{ns}**

Maximum net intensity of loading that the soil can safely support without the risk of shear failure.

$$q_{ns} = q_{nu} / FOS$$