20.7. OTHER MODES OF FAILURE OF RETAINING WALLS

In addition to the three types of failures, viz, sliding, overturning and bearing failures, a retaining wall may fail in the following two modes if the soil below is weak.

(1) Shallow shear Failure. This type of failure occurs along a cylindrical surface ABC passing through the heel of the retaining wall (Fig. 20.9). The failure takes place because of excessive shear stresses along the cylindrical surface within the soil mass. However, it has generally been found that the factor of safety against horizontal sliding discussed in Sect. 20.3 is lower than that for the shallow shear failure. Consequently, if the factor of safety against sliding (F_s) is greater than about 1.5, shallow shear failure is not likely to occur.

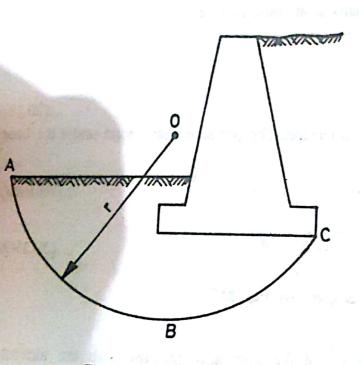


Fig. 20.9. Shallow Shear Failure.

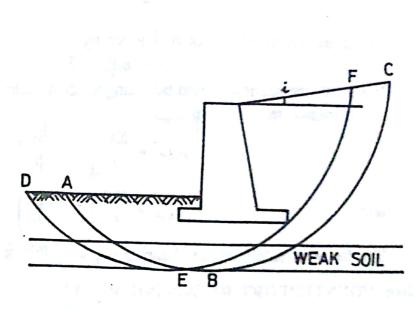


Fig. 20.10. Deep Shear Failure.

(2) Deep shear failure. This type of slope failure occurs along a cylindrical surface ABC (Fig. 20.10), when there is a weak layer of soil underneath the wall a depth of about 1.5 times the height of the wall. The critical failure surface is determined by trial and error procedure.

For the backfills having slope *i* less then 10°, it has been found that the critical failure surface *DEF* passes through the edge of the heel slab. The minimum factor of safety is found by trial and error, taking different circles, and determining the resisting forces and the driving forces along the failure surface (See Teng, 1962).

When a weak soil layer is located at a shallow depth below the retaining wall, the possibility of deep shear failure should be investigated. The possibility of excessive settlement should also be looked into. Sometimes, piles are used to transmit the foundation load to a firm layer below the weak layer. However, care shall be taken in the design of piles so that the thrust of the sliding wedge of soil does not cause bending of the piles.