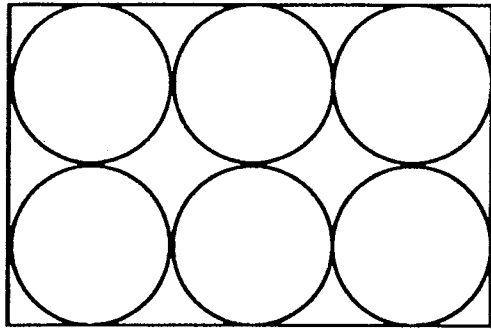
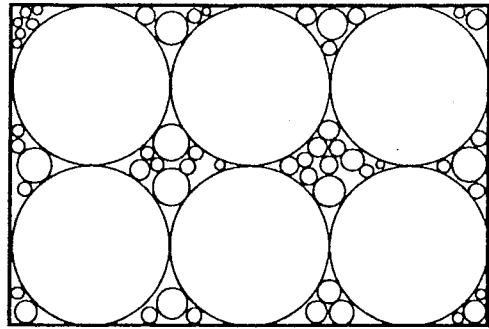


TABLE 1.3.1 Typical Range of Porosity Values

Material	<i>n</i>
Unconsolidated Material	
Gravel	0.20–0.40
Sand	0.25–0.55
Silt	0.35–0.60
Clay	0.35–0.65
Sedimentary Rock	
Sandstone	0.05–0.50
Limestone, dolomite	0–0.30
Karst limestone	0.05–0.50
Shale	0–0.10
Crystalline Rock	
Basalt	0.05–0.35
Fractured basalt	0.05–0.50
Dense crystalline rock	0–0.05
Fractured crystalline rock	0–0.10



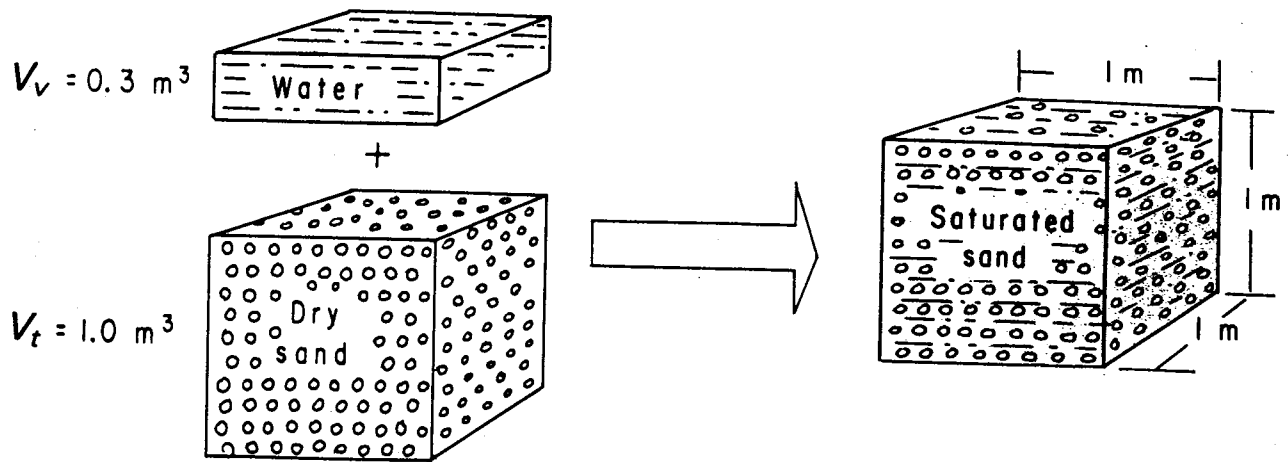
(a)



(b)

Figure 2.4 (a) Cubic packing of spheres of equal diameter with a porosity of 47.65%. (b) Cubic packing of spheres with void spaces occupied by grains of smaller diameter, resulting in a much lower overall porosity.

SOURCE: Beolient et al., 1999

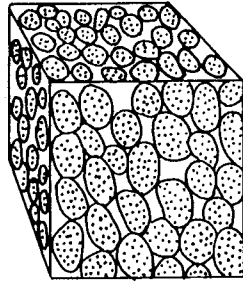


$$\text{Porosity } (n) = \frac{\text{Volume of voids } (V_v)}{\text{Total volume } (V_t)} = \frac{0.3 \text{ m}^3}{1.0 \text{ m}^3} = 0.30$$

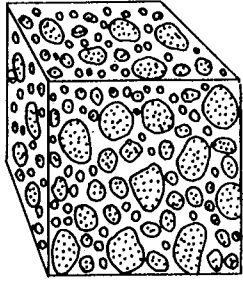
Figure 6. Illustration of Porosity

SOURCE: EPA/625/4-85/016

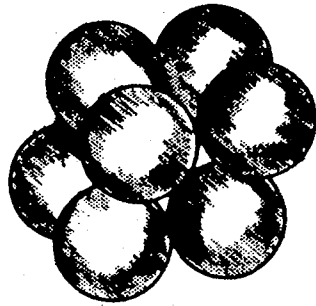
Primary Openings



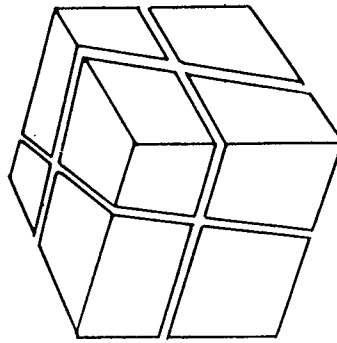
Well-Sorted Sand



Poorly-Sorted Sand

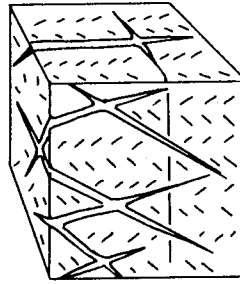


Porous Material

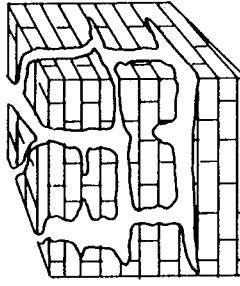


Fractured Rock

Secondary Openings



Fractures in Granite



Caverns in Limestone

Figure 1. Composition of Rocks Near the Earth's Surface

Figure 2. Different Kinds of Voids in Rocks

SOURCE: Freeze, R.A. & J.A. Cherry
Groundwater
Prentice-Hall, Inc., 1979

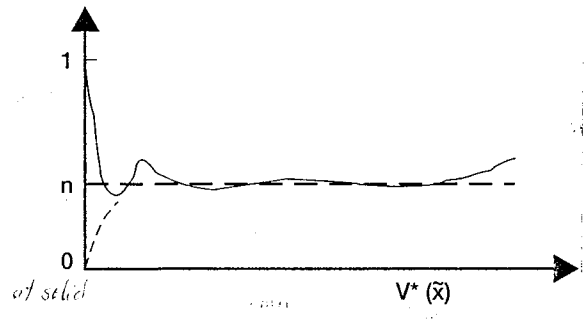
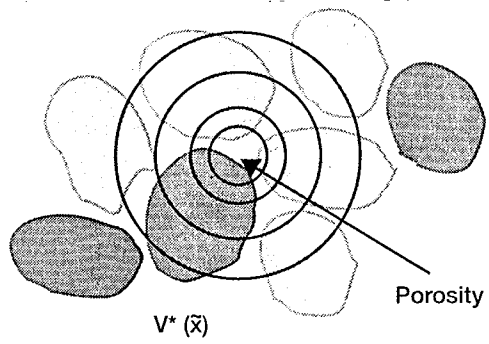


FIGURE 1.3.1 Estimation of porosity by averaging over a representative elementary volume (REV)