

Soil Permeability for Landfill Construction

The composition of soil has important consequences on its permeability. Some soils (clays in particular) have the ability to retard the flow of water. This is why compacted clay liners and covers are frequently required for landfill construction, and are typically specified by rules and by construction permits.

Experiment Steps

1. Put coarse sand in one glass.
2. Put moistened well-mixed clay in another glass.
3. Put a mixture of soil types parentheses including topsoil rich and hummus and a third class.
4. Assure that each material is carefully compacted into the glass to reduce as many air voids as possible.
5. Push a finger into each glass and smear the sample to the wall of the glass. This will prevent wall effects that will interfere with the experiment.
6. Pour some water with food coloring into each glass and observe what happens:
 - In the glass with the sand, the water will fall to the bottom quickly.
 - In the glass with the clay, water should remain on the top, or penetrate the clay only very slowly.
 - In the glass with mixed soil and humus, water is absorbed and distributed homogeneously.

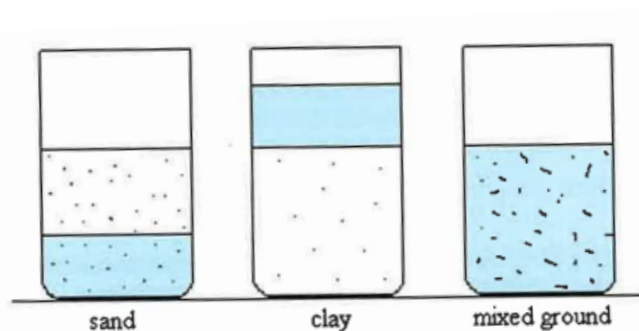


Figure 2-Permeability of different types of soil components. In blue the distribution of water.

Discussion

Q: Why are clay soils preferred (and usually required) to line and cap landfills?

- A: To control seepage from a landfill while it is operating, and to prevent precipitation from infiltrating closed landfills.

Q: What properties do the three soil types have that account for the results in the experiment?

- A: Sand- Coarse grains, rounder grains, large pore spaces, connections between pore spaces, high soil permeability
- Clay- Very small grain size, platy-shaped grains, small and poorly-connected pore spaces, low soil permeability
- Mixed Soil- Random grain size, pore space, and pore connections; lower permeability than sand, but somewhat unpredictable.