

22.2 Seepage Prevention with Impermeable Membranes

The use of flexible, impermeable membranes to prevent the seepage of water and wastes is increasing, with application to a wide variety of seepage situations. The materials used as membranes are synthetic, organic, high polymers in the form of relatively thin, flexible, impermeable sheeting. Most used are plasticized polyvinyl chloride (PVC), polyethylene, and Butyl rubber. They all possess low permeability which, when combined with the strength of soil or other base material, will prevent seepage of water or aqueous solutions. While the membranes differ somewhat from each other, they differ completely from rigid materials such as concrete, asphalt and planking in that they are not expected to contribute structural strength- only impermeability.

The earth itself will generally support high hydrostatic loads, but the sheeting employed as a membrane is often required to follow earth movements and settlements while retaining its impermeability. This adds several other considerations to that of impermeability. The membrane must resist puncturing during installation, and must be able to adapt to soil deflections without tearing or puncturing. Vinyl (PVC) has the highest puncture resistance, with Butyl in second place. Polyethylene ranks as poor in this respect. Both vinyl and Butyl have high elastic strain and will yield with soil deflections. Polyethylene does have a high elongation, but it becomes thin in localized areas under stress and hence is less desirable than the other sheetings is formulated to meet specifications for long life and resistance to soil attack.

Typical properties of these three membranes are:

Tensile strength, Elastic strain, percent, Puncture resistance, Available gauges, Available widths, Method of joining, Weight, Density, Cost, Installation.

Installation of liners for preventing seepage is quite simple after the earth has been prepared. In designing structures to utilize membranes, a side slope of at least 3:1 is necessary if the liners are to be covered for protection. For uncovered membranes, a normally stable slope can be used. In both cases, all sharp rocks, stones, roots, and other.

