## 2.6 EVALUATION OF CAPILLARY PRESSURE CURVES

**Theoretical evaluation** – Difficult except for uniform rods/spheres

Use $P_c = (2\sigma/r)\cos\theta$

eg. Collins (1961) for packed rods

$R$ = radius

Limited $S_w$ range since result valid only until adjacent fluid interfaces contact.

**Laboratory Methods** $P_c = P_c(S_w)$

a) Displacement methods: Establish successive states of hydrostatic equili

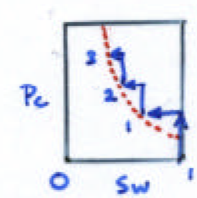
b) Dynamic methods: Establish successive states of hydraulic steady flow

Both with a wetting and non-wetting fluid.

**Displacement methods**

Porous diaphragm method:

1. Wetted core inside non-wetting fluid.
   Underlain by diaphragm disc – permeable but not to the non-wetting fluid.
2. Increase pressure of non-wetting (displacing) fluid and wait for equilibrium (saturation)
   Trace curve with: 1., 2., 3, etc.




3. Determine saturation from displaced fluid or X-ray/CT scan.

Limitations: 1. Length of time for equilibrium. 10-20d per point?
2. Is all pore space being accessed? Does it matter?

Advantage: Uses 'real' fluids (of interest).

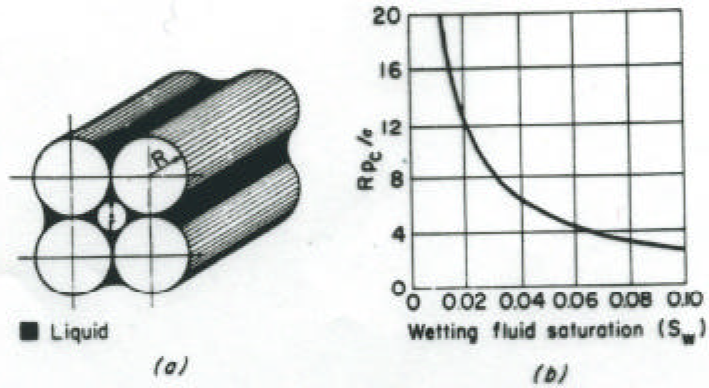



FIG. 9.2.13. Capillary pressure in a cubic packing of circular rods with liquid-air interfaces (after Collins, 1961).

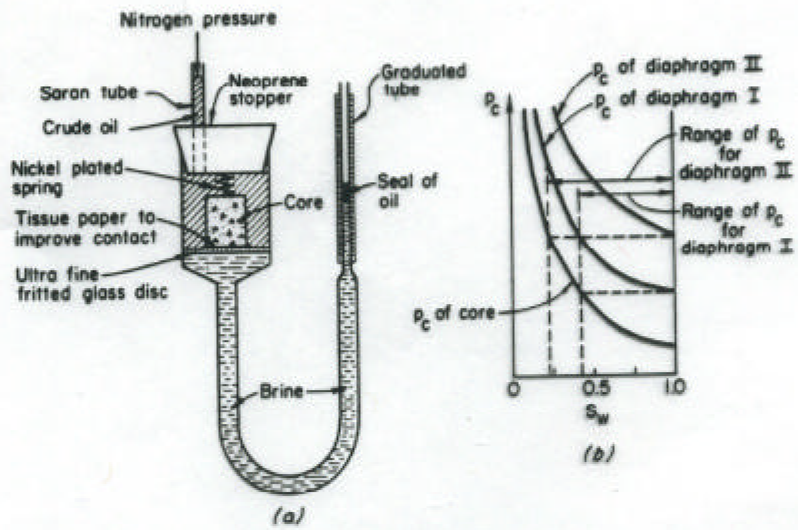



FIG. 9.2.14. Schematic diagram of a porous diaphragm device for capillary pressure determination (Welge and Bruce, 1947).

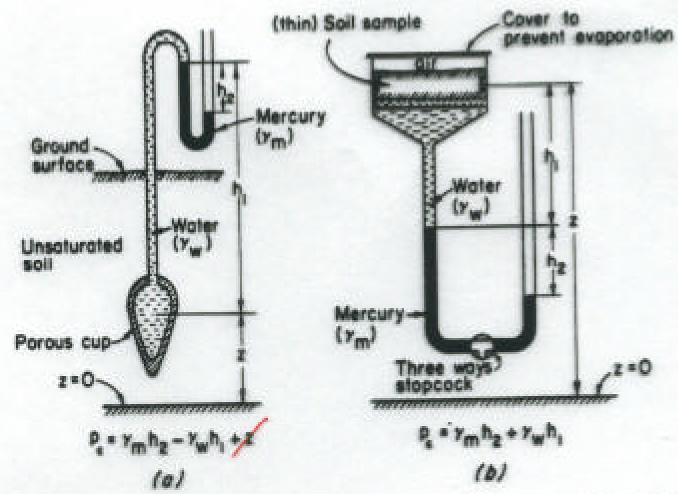



FIG. 9.4.4. The use of mercury tensiometer manometers. (a) Measurement of capillary pressure in the field, (b) the Haines apparatus for determining $p_c = p_c(S_w)$.