**Differential Hydrostatic Pressure Between Cement in the Annulus and Mud inside the Casing**

1. Determine the hydrostatic pressure exerted by the cement and any mud

remaining in the annulus.  
2. Determine the hydrostatic pressure exerted by the mud and cement

remaining in the casing.  
3. Determine the differential pressure.

Sample Case : 9-5/8 inch casing — 43.5 lb/ft in 12-1/4 inch hole :

Well depth = 8000 ft  
Cementing program :  
 LEAD slurry 2000 ft = 13.8 lb/gal  
 TAIL slurry 1000 ft = 15.8 lb/gal  
Mud weight = 10.0 lb/gal  
Float collar (No. of feet above shoe) = 44 ft

Determine the total hydrostatic pressure of cement and mud in the annulus -

a. Hydrostatic pressure of mud in annulus :

HP (psi) = 10.0 lb/gal x 0.052 x 5000 ft

= 2600 psi

b. Hydrostatic pressure of LEAD cement :

HP (psi) = 13.8 lb/gal x 0.052 x 2000 ft

= 1435 psi

c. Hydrostatic pressure of TAIL cement :

HP (psi) = 15.8 lb/gal x 0.052 x 1000 ft

= 822 psi

d. Total hydrostatic pressure in annulus :

psi = 2600 psi + 1435 psi + 822 psi

= 4857

Determine the total pressure inside the casing

a. Pressure exerted by the mud :

Hp (psi) = l0.0 lb/gal x 0.052 x (8000 ft – 44 ft)

= 4137 psi

b. Pressure exerted by the cement :

HP (psi) = 15.8 lb/gal x 0.052 x 44 ft

= 36 psi

c. Total pressure inside the casing :

psi = 4137 psi + 36 psi

= 4173

**Differential pressure**

PD = 4857 psi - 4l73 psi

= 684 psi