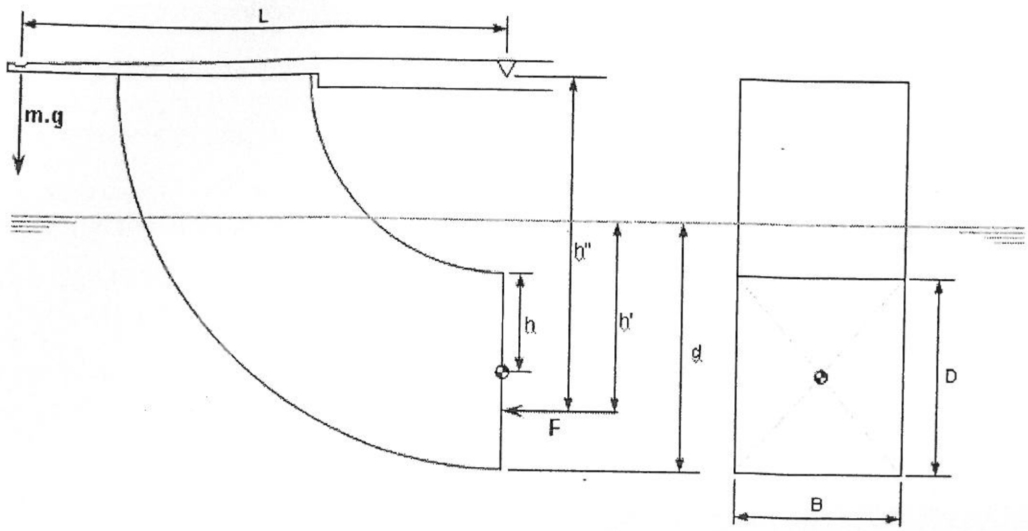
$$h'' = H - \frac{d}{3}$$

The turning moment can then be calculated.

Fully Submerged Vertical Plane

For the case where the vertical face of the quadrant is fully submerged:



Where:

d is the depth of submersion,

F is the hydrostatic thrust exerted on the quadrant,

h' is the depth of the centre of pressure,

h" is the distance of centre of pressure below the pivot,

B is the width of the surface, and

D is the depth of the surface

W is the weight on the hanger (=mg)

Hydrostatic Thrust

The hydrostatic thrust F can be defined as

$$F = \rho g A h = \rho g B D \left(d - \frac{D}{2} \right) \qquad \text{......................(5)}$$

Experimental Depth of Pressure

The moment, M, can be defined as

$M = Fh''$ (Nm)

where:

m is the mass on the weight hanger,

g is the acceleration due to gravity,

L is the length of the balance arm,

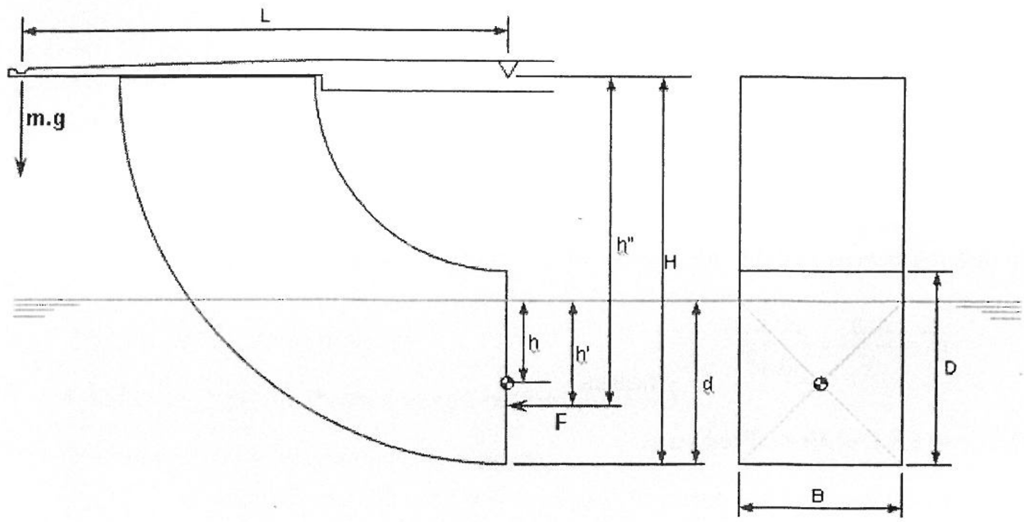
F is the hydrostatic thrust, and

h is the distance between the pivot and the centre of pressure.

Hence by calculating the hydrostatic thrust and centre of pressure on the end face of the quadrant, we can compare theoretical and experimental results.

Partially Submerged Vertical Plane

For the case where the vertical face of the quadrant is partially submerged:



Where:

L is the horizontal distance between the pivot point and the weight hanger,

H is the vertical distance between the pivot and the base of the quadrant,

D is the height of the quadrant face, B is the width of the quadrant face,

d is the depth of water from the base of the quadrant, and

h' is the vertical distance between the surface and the centre of pressure.

The forces shown are F, the hydrostatic thrust, and m.g, the weight.

Hydrostatic Thrust:

The hydrostatic thrust can be defined as:

$F = \rho g A h$ (Newtons)