Pressure in fluids

- **Hydrostatic Pressure** (static fluid in the presence of gravity):

$$\Delta P = \rho g h$$

Here ρ is fluid density, g is gravitational acceleration, h is the depth difference between two points, and ΔP is the pressure difference between them.

- **Bernoulli Principle** (fluid in motion, no gravity):

$$P + \frac{\rho v^2}{2} = const$$

is the speed of the fluid. The equation works only *along the flow*.

Homework

Water in a house is supplied from the water tower. The water level in the tower is at the height H=30m above the ground.

a) Find the pressure in the water line in a bathroom on the second floor, which is located at height h=5m above the ground (in Pa)

b) Find the speed v of the running water when the tap is fully opened. (remember to use SI units)

c) Find the time needed to fill a container of volume V = 1 liter. Assume the inner radius of the faucet to be r=1 cm.

d) Use part c to measure the speed of the running water in your bathroom (note that faucet may have a different radius than 1 cm)

Atmospheric pressure

30m

5 m