How do I calculate pressure height corrections? (FAQ - Pressure)

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Pressure height corrections are sometimes known as *hydrostatic head corrections* or *fluid head corrections*.

Pressure in a fluid, whether it be gas or liquid, varies with height. It doesn't matter whether the fluid is in pipework or more loosely confined such as the atmosphere or the sea - just so long as there is gravitational attraction and something stopping free-fall (or a centripetal force - for those who are pedantic, in orbit or who twirl open cups of tea on horizontal cords).

If a pressure value at a different height from that of the measuring instrument is required, an allowance has to be made for the intervening *hydrostatic head*. The pressure at a height *h* metres *above* that of the measuring instrument is given by:

$$p_h = p_i - dgh/u$$

where:

- p_h is the pressure at level *h* metres above the measuring instrument.
- p_i is the pressure at the height of the measuring instrument.
- d is the density of the fluid in $kg \cdot m^{-3}$.
- g is the local value of gravitational acceleration in $m \cdot s^{-2}$.
- h is the vertical distance (height) of the liquid surface above the level at which the pressure value is being determined.
- u is a factor which converts the height correction term from pascals to the pressure units being used.

This expression is valid for small height differences. Within buildings it may be used to calculate the difference in the value of atmospheric pressure from floor to floor but only provided that there are no other causes of pressure differential such as atmospheric turbulence, air-conditioning fans etc.

Liquids are, to a good approximation, incompressible and so the correction for liquid systems can be expressed in terms of a pressure difference per unit height; for example its value for water is very roughly 10 kPa per metre. Gases are compressible so the correction is pressure-dependent and can be expressed as a proportion of the pressure value; very roughly, 1 part in 10 000 per metre at atmospheric pressure.

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