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# Fluid Mechanics

## PRESSURE AND FLUID STATICS

by

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# Chapter Description

- Expected Outcomes
  - Define relationship between Absolute Pressure and Gauge Pressure .
  - Calculate pressure by different measurement devices: mercuric Barometer, Piezometer, Manometer and etc.
  - Compute Hydrostatic Force on Submerged Plane.

# TOPICS

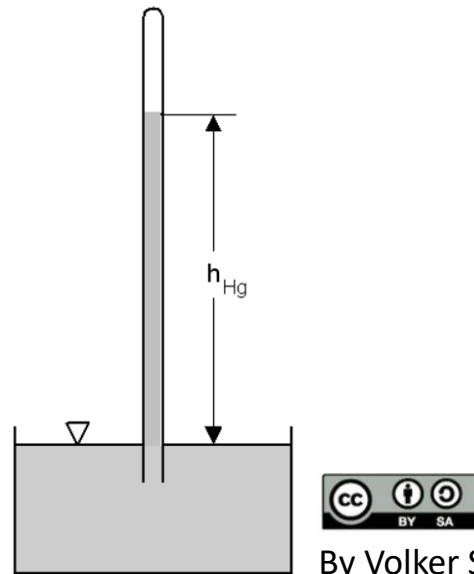
WEEK	CHAPTER	TOPIC	
<b>3</b> 19 – 21 Sept	<b>2</b>	<b>Pressure and Fluid Statics</b>	
		2.1	Pressure
		2.1.1	Absolute Pressure and Gauge Pressure
		2.1.2	Pressure and Force
		2.2	Pressure Measurement Devices
		2.2.1	The Barometer
<b>4</b> 26 – 28 Sept		2.2.2	The Manometer
		2.3	Fluid Statics
		2.3.1	Introduction to Fluid Static
<b>5</b> 3 – 5 Oct		2.3.2	Hydrostatic Forces on Plane Surface
		2.3.3	Hydrostatic Forces on Curved Surface
		2.3.4	Buoyancy and Stability
		2.3.5	Fluid Flow Concept

## 2.2 Pressure Measurement Device

- In order to measure pressure, the relationship between pressure and head is used.
- A liquid gauge such as manometer and barometer are used. Based on principle that an elevation change of  $\Delta z$  in a fluid at rest corresponds to  $\Delta P/\rho g$ , which suggests that a fluid column can be used to measure pressure differences.
- These method utilizes the change in pressure with elevation to evaluate pressure.
- Various methods to measure the pressure are :
  - **Barometer**
  - **Manometer**

## 2.2.2 The Barometer

- Use to measure atmospheric pressure.
- Consists of a glass tube closed at one end with the open end immersed in a container of mercury
- For most practical purposes the contribution of the vapor pressure can be neglected since it is very small.

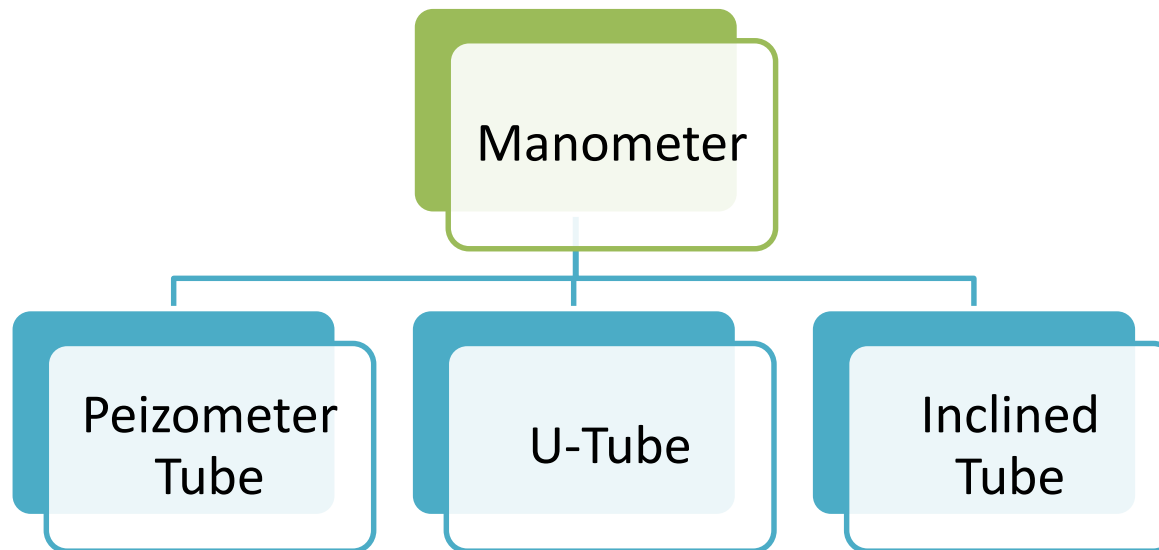


By Volker Sperlich

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## 2.2.2 The Manometer

- A pressure measuring devices.
- Involved the used of liquid columns in vertical or inclined tubes containing one or more fluids such as mercury, water, alcohol, or oil..
- Principle : an elevation change of  $\Delta z$  in a fluid at rest corresponds to  $\Delta P/\rho g$ .



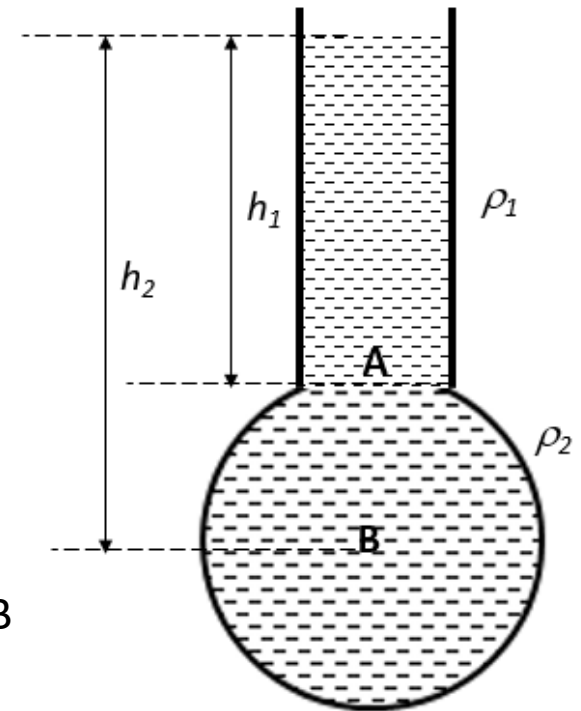
Common type of manometer

# i. Piezometer

- The simplest manometer, open at the top.
- Measure pressure via the rise of a fluid column.
- This method can only be used for liquids (i.e. not for gases) and only when the liquid height is convenient to measure. It must not be too small or too large and pressure changes must be detectable.
- Pressure at A = pressure due to column of liquid above A
- Pressure at B = pressure due to column of liquid above B

$$P_A = \rho_1 g h_1$$

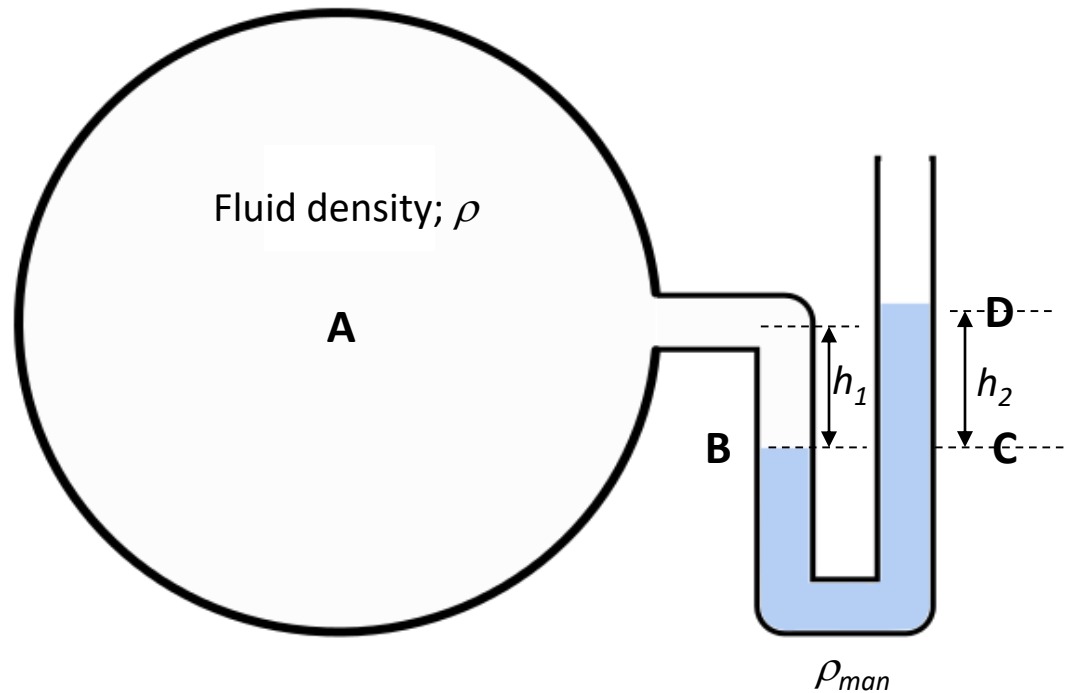
$$P_B = \rho_2 g h_2$$



## ii . U- Tube

- "U"-Tube enables the pressure of both liquids and gases to be measured with the same instrument.

- $$P_A = \rho_{man}gh_2 - \rho gh_1$$



 By Olivier Cleyen

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